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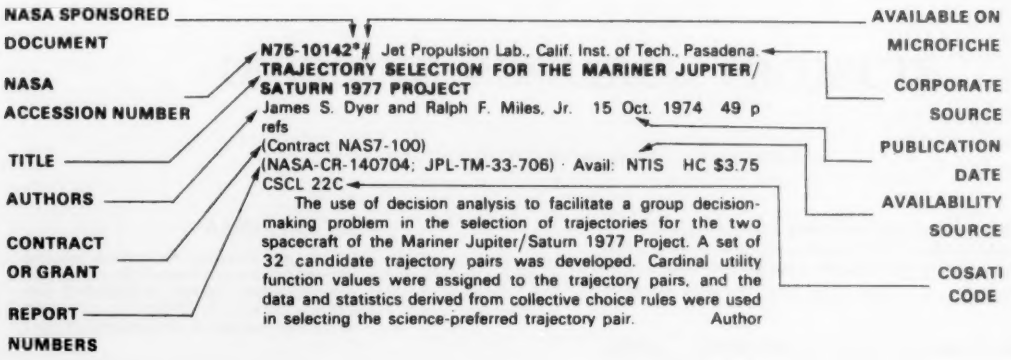
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COSATI CODE
N75-10142*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
TRAJECTORY SELECTION FOR THE MARINER JUPITER/ SATURN 1977 PROJECT
James S. Dyer and Ralph F. Miles, Jr. 15 Oct. 1974 49 p refs
(Contract NAS7-100)
(NASA-CR-140704; JPL-TM-33-706) Avail: NTIS HC $3.75
CSCL 22C
The use of decision analysis to facilitate a group decision-making problem in the selection of trajectories for the two spacecraft of the Mariner Jupiter/Saturn 1977 Project. A set of 32 candidate trajectory pairs was developed. Cardinal utility function values were assigned to the trajectory pairs, and the data and statistics derived from collective choice rules were used in selecting the science-preferred trajectory pair. Author

ON-GOING RESEARCH PROJECTS

This is a listing of research projects - not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power: Aircraft Stability and Control; and Research And Support Facilities (air). For Related Information See Also Astronautics.

1.0001, AERO-THERMAL INTERFERENCE HEATING, PART I
J. POND, Lockheed Aircraft Corporation, *Huntsville, Alabama* 35807 (F08635-74-C-0078)

To develop a general methodology for determining aero-thermal inviscid supersonic interference flow fields for aircraft with externally carried weapons.

The program to determine aero-thermal supersonic interference flow fields for aircraft with externally carried weapons will be pursued in two phases, Phase I and Phase II. The effort to be accomplished for Phase I will be done under this work unit--Phase II will be a follow-on effort. Phase I will consist of contractually developing a methodology for determining supersonic interference flow fields for aircraft with externally carried weapons, using inviscid aerodynamics. The methodology to be developed will employ the latest state-of-the-art technology. Once the effort described for this work unit has been accomplished, Phase II will begin. Phase II will consist of using the technique generated under Phase I and boundary layer theory to develop a methodology for determining the three-dimensional boundary layer that exists on an externally carried weapon of interest which is being analyzed. The boundary layer methodology, when combined with the inviscid aero- methodology, will provide a capability for determining convective heat transfer coefficients for externally carried aircraft weapons of interest.

Supporting agency address information: AF Armament Laboratory DLJA, Eglin AFB, Fla. 32542

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0002, STORM HAZARDS TO AVIATION
J.T. LEE, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302

Project objective: To determine tornado characteristics such as maximum wind speed, horizontal extent, and evolution for use in the study of tornadic storm formation. To determine the distributions of hazardous thunderstorms for identifying such conditions and communicating information about them so as to improve safety of aircraft operations.

Current Year Plan: An instrumented fighter type aircraft will be used to measure turbulence in areas of thunderstorms characterized by large horizontal wind shear or large variances of the Doppler spectrum. Relationships between the turbulence measured by the aircraft and the data obtained by the indirect (Doppler radar) probes will be ascertained. Groups in suitably equipped surface vehicles will be directed so as to intercept tornadic storms and photograph their life history. These photographs will be analyzed for insight into tornado dynamics.

Progress report: Suspected turbulence areas as defined by strong horizontal shear depicted on the NSSL MVP were penetrated by instrumented aircraft. Dual-Doppler data were obtained during the penetration for the first coordinated aircraft and dual-Doppler sampling of thunderstorm turbulence.

Photogrammetric analysis of debris and peripheral cloud motion for the Union City, Oklahoma tornado (24 May 73) indicates wind speeds of 65 m sec-1 about 200 m from the funnel wall.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

1.0003, ANALYSIS OF WING PRESSURE DISTRIBUTION AND BOUNDARY LAYER DATA ON THE C-5A AIRCRAFT
J.F. CAHILL, Lockheed Georgia Company, *Marietta, Georgia* 30060 (F33615-73-C-4168)

AF function - transonic aerospace vehicles. Deficiency - inability to predict scale effects in the shock-induced separation characteristics of transonic aircraft. Research - analysis of high Reynolds number flight data on wing pressure distribution and boundary layer characteristics. How research contributes - analyzes wing pressure distributions and boundary layer data from wind tunnel and flight tests in an attempt to further quantify scale effects. Ultimate technical objective is to better understand scale effects on shock-induced separation phenomena. This program's payoff to the AF will be in better predictions of aerodynamic loads on future transonic AF systems. The results of this effort will be available for comparison with data which will be obtained from proposed new high Reynolds number facilities.

Wing pressure distribution data will be provided for all of the test conditions measured under contract F33657-71-A-0083-0008. Scale effects on shock location and trailing-edge pressure recovery will be investigated by comparing the flight test data with available wind tunnel data. Boundary layer parameters will be presented as functions of Reynolds number, Mach number, and local angle of attack. These boundary layer data will be compared with various available theories.

Supporting agency address information: Aerospace Research Laboratory LH, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0004, PULSE PAIR PROCESSOR RECORD/REPRODUCE SYSTEM
F.E. COMPTON, Raytheon Company, *Wayland, Massachusetts* 01778 (F19628-74-C-0079)

AF function - flight operations and terminal forecasting. Deficiency - flight operations are hampered by our inability to detect and predict hazardous regions in storms. Development - development of pulse pair processor record/reproduce system for developing improved techniques. How development contributes - the system will permit continuous recording. The pulse pair processor record/reproduce system will permit the recording of mean Doppler frequency and signal spectrum width by the pulse pair technique with a greater computational efficiency in analysis and definition of the environment.

Supporting agency address information: AF Cambridge Research Laboratories LY, L. G. Hanscom Field, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0005, ALTERNATE ENERGY SOURCES FOR AIRCRAFT PROPULSION
H. WITTENBERG, Technische Hogesch. Te Delft, *Delft, Netherlands*

In the disciplinary group 'Aircraft Design and Flight Mechanics' of the Department of Aeronautical Engineering a study is performed on the design and performance of civil aircraft with propulsion systems using non-conventional energy sources. As a first project a preliminary design of an aircraft with a nuclear reactor has been finished (preliminary report M211 'Prospects and Problems of the Nuclear Propelled Aircraft').

The project was part of a post-graduate study, fulfilled in cooperation with the disciplinary group on nuclear engineering of the Department of Mechanical Engineering at Delft.

The second project is the design of an aircraft with liquid hydrogen as fuel. A detail-study on the design of the fuel tanks will be completed early 1975. The aircraft design study will be performed in 1975/1976, dependent on available staff.

SUPPORTED BY Delft Technical University - Netherlands

1.0006, WING-BODY AERODYNAMIC INTERFERENCE INVESTIGATION - FUSELAGES OF GENERAL CROSS-SECTIONS
A.R. KRENKEL, Polytechnic Inst. of New York, School of Engineering, *Brooklyn, New York* 11201 (NSG 1107)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0007, POTENTIAL ROLE OF THE HELICOPTER IN URBAN TRANSPORTATION
J.S. DAJANI, Duke University, School of Engineering, *Durham, North Carolina* 27706 (NSG 1121)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0008, COMPUTER AIDED DESIGN METHODOLOGY
N.M. AUME, U.S. Air Force, Aerospace Med. Res. Lab., *Dayton, Ohio* 45433

To furnish a Human Engineering Computer Aided Design (HECAD) in combination with Computerized Biomechanical Man-Model (COMBIMAN) to provide an interactive computer graphic design program for use in crew station design.

Initial data banks are developed with information on the workspace panel configuration, control/display components and task sequences to be accomplished for specific system/mission applications. The anthropometric data bank in COMBIMAN will provide data on size and biomechanical capabilities of the operator. By using the stored data bank information, workspace layout and panel configuration can be designed and evaluated by interactive computer graphic techniques. Specific criteria for task/mission performance effectiveness are established for purposes of panel/workspace evaluation. This work was formerly reported under workunit 7184-08-07, Biomechanical Criteria of the Design of AF Systems.

Supporting agency address information: 6570 Aerospace Medical Rsch. Lab. HE, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0009, REENTRY HEATING ENERGIES ANALYZER (RHEA)
E.G. JOHNSON, U.S. Air Force, Aerospace Research Labs., *Dayton, Ohio*

AF function - aerospace vehicles (hypersonic flight). Deficiency - duplication of reentry environments in ground facilities. The ability to test weapons and their subsystems at pressures, temperatures and velocities associated with vehicle reentry. How research contributes - by investigating ways to simulate the true flight conditions experienced by high speed vehicles and reentering ballistic missiles with respect to aerodynamic characteristics of materials resistivity, wake characteristics, and aero and thermomechanical phenomena. Studies will concern a concept to employ novel energy transfer processes for the generation of high Mach number air flows, having true flight stagnation temperature and pressure. Studies leading to the design and construction of a prototype which can accommodate large-to-full scale reentry bodies or their components will be proposed if the research results so warrant.

Data is required for determining the design of the highly loaded components of the intermediate RHEA system. ARL's existing physical resources are adequate to support the RHEA program when the required facilities and personnel are committed. The RHEA concept could lead to a practical ground testing feasibility with a combined ablation/erosion capability which would duplicate the reentry environment to a very low altitude. Later studies will examine the mechanical problems associated with accommodating the fluid dynamics processes for this case as part of the overall feasibility studies. In the feasibility studies, while the fluid mechanics aspect of the RHEA processes are conceptually clear, how they can be employed to result in a desired facility performance must be proved. Contract and in-house studies on what have been determined to be key research problems have been identified and will be investigated as available assets permit. At the present time, the only effort being expended is that of a visiting scientist--all other efforts are being held in abeyance awaiting decision of funding for the work unit.

Supporting agency address information: Aerospace Research Laboratory LF, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0010, DETERMINE LOADING BEHAVIOR OF MK7-1 AND MK7-2 ARRESTING GEAR
R.S. EBERS, L T V Aerospace Corporation, *Dallas, Texas* 75222 (N00019-75-C-0237)

To correct current information to correspond to the loading behavior derived from airplane test data.

The approach will consist of data gathering and data analysis to establish optimum characteristics for loading behavior of the arresting gear.

Supporting agency address information: Naval Air Systems Command, Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

ASTRONAUTICS

Includes Astronautics (general); Astrodynamics; Ground Support Systems and Facilities (space); Launch Vehicles and Space Vehicles; Space Transportation; Spacecraft Communications; Command and Tracking; Spacecraft Design, Testing, and Performance; Spacecraft Instrumentation; and Spacecraft Propulsion and Power. For Related Information See Also Aeronautics.

2.0001, VIKING 75 ORBITER
M.H. CARR, U.S. Dept. of the Interior, Geological Survey, *Menlo Park, California* 94025

The purpose of the project is to extend our geologic understanding of Mars by acquiring additional high resolution photography of the planet. The project involves assessing the objectives of the on-going Mars exploration program and determining how the capability of the Viking Orbiter cameras can be utilized to realize these objectives. The design of the Orbiter camera, the development of the ground operation system and integration with the rest of the Viking project are all being followed to ensure maximum scientific return from the experiment. The present plan is to launch the Viking spacecraft in 1975. The main data- taking period will be from July to November 1976.

SUPPORTED BY U.S. Dept. of Interior - Geological Survey

2.0002, LOW REFLECTIVITY SOLAR CELLS
J.A. SCOTTMONCK, Textron Incorporated, *San Fernando, California* 91342 (F33615-74-C-2044)

Develop a silicon solar cell with optical coatings and surfaces that minimize reflected light intensity at all wavelengths, thereby improving cell energy/conversion efficiency and reducing solar array detectability or positive identification. Resultant cell shall be suitable for Air Force satellite vehicle applications.

All work performed under this program should be in accordance with a detailed technical plan prepared by the contractor and approved by the AFAPL project engineer. This plan shall define the technical approach which will be followed by the contractor to meet the requirements of this exhibit. The contractor will include additional 'go/no-go' decision points in the technical

plan. These are the points at which critical assessment of the individual work efforts relative to the contract objective will occur and a decision will be recommended to AFAPL to continue or modify the technical approach. Recommended modifications in the technical approach shall be prepared as revisions to the technical plan, and submitted to the AFAPL project engineer prior to accomplishing the work described therein. This plan shall not alter contract requirements, but shall define the methods and approach by which the contract requirements will be met.

Supporting agency address information: AF Aero-Propulsion Laboratory POE, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

2.0003, SPACE RESEARCH TECHNOLOGY
T.A. CHUBB, U.S. Navy, Research Laboratory, *Washington, District of Columbia* 20390

(1) To develop and construct demonstration devices of value to the Navy and DOD based on technology developed for the rocket program, e.g., IR, visible and UV surveillance sensors based on image converters and solid state arrays used in space astronomy. (2) To develop devices needed for the NRL rocket and satellite program: position determining x- ray sensors, band sensitive optical detectors, thick film electronic packaging techniques and counter-shift register circuitry using such packaging, telemetry decoding systems, and computer data interfaces as necessary.

Image converter designs developed in the far UV astronomy program are high vacuum packaged and equipped with cesiated photocathodes. Point anode proportional counter arrays are constructed and electronically interfaced to provide x-y photon location. High gain point anode proportional counters and trigger circuits are developed for single photon counting in the UV. Multilayer substrate networks are designed and built for digital circuitry.

Supporting agency address information: Naval Research Laboratory (7000), Washington, D.C. 20375

SUPPORTED BY U.S. Dept. of Defense - Navy

2.0004, TECHNICAL PROBLEMS RELATED TO ORBITAL CAPTURE OF PASSIVE OBJECTS
M.H. KAPLAN, Penn. State University, School of Engineering, *University Park, Pennsylvania* 16802 (NSG 7078)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

2.0005, THE ON-BOARD DETERMINATION OF THE ORBIT OF A SATELLITE USING CHEBYSHEN SERIES
T. FEAGIN, Univ. of Tennessee, Graduate School, *Knoxville, Tennessee* 37916 (NSG 5040)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

2.0006, DOPPLER/LRPDS POSITIONING SYSTEM
G.W. SCHMEIDEL, U.S. Army, Surveying & Engineering Div., *Fort Belvoir, Virginia* 22060

To verify the feasibility of combining the capabilities of an aircraft based multistation positioning system (Long Range Position- Determining System - LRPDS), and a satellite based positioning system (Navy Navigation Satellite System - NNSS) into a man-packed, field deployed positioning unit that would retain the weight and form factors required by the LRPDS.

To examine the circuitry for the LRPDS and Doppler positioning set to define circuit commonality. To add to an existing LRPDS positioning set that circuitry identified as unique to the Doppler positioning set, and to modify the LRPDS software to solve both problems.

Supporting agency address information: OCE ETL Surveying and Engineering Division TDL, Ft. Belvoir, Va. 22060

SUPPORTED BY U.S. Dept. of Defense - Army

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, CHARACTERIZATION OF SURFACES ON AN ATOMIC SCALE BY FIELD IONIZATION ENERGY SPECTRA
A.J. JASON, Univ. of Alabama, School of Arts, *University, Alabama* 35486 (AF-AFOSR-2726-74)

Metals in aircraft structures and in gas turbine engines are susceptible to degradation and failure through surface reactions and surface flaws. By understanding the characteristics of surfaces, protective coatings can be devised to reduce degradation and extend the useful life of aerospace materials. This characterization of the surface on an atomic scale is a difficult task, but correspondingly important since many general properties relating to the surface depend directly on microscopic structure. The Field Ion Microscope (FIM) has been extensively used to examine individual atom positions on the surface of a fine metal tip by absorbing gases on the surface, field ionizing them and recording their spatial distribution on a phosphor screen. This work will examine the energy spectra of field ionization products originating above single surface atoms. Measurement of the relative ionization rates and energy distributions above single atoms will provide a basis for interpreting the energy structure of surface atoms, dislocations, grain boundaries and fatigue cracks. The FY 75 effort will initially be restricted to tungsten substrates imaged with rare gases and hydrogen.

Supporting agency address information: AF Office of Scientific Research NE, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0002, ALTERNATIVES TO THE CONVENTIONAL USE OF PETROLEUM
R.L. FIELD, U.S. Navy, Civil Engineering Lab., *Port Hueneme, California* 93041

To perform RDT&E resulting in equipment, techniques, policies and criteria for beneficial utilization of alternatives and improvements to the conventional use of petroleum products in Navy power plants and equipment.

The capability of using synthetic, waste, and substitute fuels to improve utilization of naval energy resources. The probability of safety hazards when JP-5 is used as a substitute fuel in Navy dry-sump diesels will be examined, procedures for such use will be recommended. Guidance for Navy applications of fluidized bed systems will be developed, and technical support will be provided to demonstrations of fluidized bed systems. Possible improvements/modifictions of coal- and oil-burning systems for Naval shore facilities will be investigated. New developments for obtaining energy from solid waste will be evaluated, and system(s) best suited to Navy use will be recommended. The potential benefits of synthetic lubricants will be evaluated, and guidance and recommendations for recovery and recycling of lubricants will be developed.

Supporting agency address information: Naval Facilities Eng. Command (03E), 200 Stovall Street, Alexandria, Virginia 22332

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0003, MATERIAL SUPPORT TECHNOLOGY - CHEMICAL ENERGY PARTITIONING
W.A. SANDERS, Catholic University of America, School of Arts, *Washington, District of Columbia* 20017 (N00014-67-A-0377-0022)

Increased knowledge of the fundamentals of exothermic chemical reactions is of importance to the Navy for material support technology. The particular areas which should benefit from this knowledge include rocket propellants, fuels, explosives, and chemical lasers.

This work will use chemiluminescence techniques to study systematically homologous series of exothermic reactions to determine the vibrational energy content of the products with the aim of determining the reaction features which will lead to efficient transfer to vibrational modes. Attempts will be made to

develop a theory, based on experiments, which will allow prediction of vibrational content of the products.

Supporting agency address information: Office of Naval Research 421, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0004, EVALUATION OF CHEMICAL RESEARCH RELEVANT TO CURRENT AND PROJECTED U. S. AIR FORCE INTERESTS

J.E. EARLEY, Georgetown University, School of Arts, *Washington, District of Columbia* 20007 (F44620-75-C-0001)

Air Force functions of flight operations, communications and logistics rely on superiority in the materials, propulsion, and avionics technologies. Advances in these technologies need long lead time discoveries in scientific chemical research. This effort provides in- depth expert scientific evaluation of research proposals in the field of chemistry. The results of this evaluation contribute to the selection of chemical research proposals of highest scientific merit. This, coupled with the scientific and relevance assessments made by AFOSR scientists, makes up the highly competitive and balanced selection procedure. This effort provides the means for in-depth scientific evaluation of chemical research proposals by leading scientists in the nation. The panel consists of 15 experts from the academic, industrial, and governmental chemical science communities. Activities typically include two meetings of the panel each year, the in-depth review of selected research proposals, and other expert consultations as requested. The combination of Air Force relevance and scientific review, coupled with the in-depth scientific review of the evaluation panel, insures the selection of research of the highest quality and relevance to Air Force interests.

Supporting agency address information: AF Office of Scientific Research NC, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0005, CHEMICAL KINETICS INFORMATION CENTER

R.F. HAMPSON, U.S. Dept. of Commerce, Natl. Bureau of Standards, *Washington, District of Columbia* 20234

The Center prepared and issued tables of rate data for use in atmospheric modelling, provided bibliographic services to the public, evaluated rate and photochemical data, coordinated preparation of text on the chemistry of the stratosphere and participated in international activities in the area of chemical kinetics.

Objective: General: To supply the R. and D. community with evaluated chemical kinetics data and related bibliographic services, on a continuing basis.

Current Objective: To supply data and bibliographic services for use in modelling of air pollution, atmospheric and combustion chemistry.

Motivation: Chemical kinetics (rate) data is scattered through the world's chemical literature and often is contradictory. The goal of this center is to provide a single source of data that may be used by technologists not expert in the field of kinetics. Evaluation of the data by experts simplifies the work of the user and reduces the chance of error. The output is needed and used by groups studying potential pollution of the stratosphere by high flying aircraft, groups modelling air pollution and control strategies, groups working on combusion and rocketry and laboratory scientists. The entire activity is part of the National Standard Reference Data System (NSRDS).

Approach: The published chemical literature and reports are scanned for rate and photochemical data. A computer-based index to selected papers is prepared. This is used for bibliographic services to the public and in-house by experts who analyze the results in order to establish either 'best values' or the need for more work. The output is all available to the public.

Progress (FY 74): (1) Accession of 1075 selected papers to the Chemical Kinetics Information File (size of file 26,500). (2) Preparation of a second supplementary bibliography to rate studies on the N/O system ('hot air chemistry') covering about 500 papers. (3) Supervision of preparation of text for the chemistry chapter of the DOT/Climatic Impact Assessment Program Monograph on the Natural Stratosphere. (4) Preparation and distribution of tables of rate data and detailed data sheets for use in atmospheric modelling (to approximately 600 persons). (5) Preparation of 19 special bibliographies and one general use list of publications. (6) Participation in work of the CODATA (ICSU) Task Group. (Text Abridged)

SUPPORTED BY U.S. Dept. of Commerce - N.B.S.

3.0006, EFFECT OF STRUCTURE ON PHYSICAL PROPERTIES OF POLYMERS

F.E. KARASZ, Univ. of Massachusetts, School of Engineering, *Amherst, Massachusetts* 01002 (AF-AFOSR-2170-72)

Air Force requirements in the area of polymers for adhesives, sealants, surface coverings and wire insulators have become increasingly demanding in the physical properties required. This research is a study of the physical properties of polymers as related to structure, so that with further knowledge new and improved polymers may be synthesized as predicted by basic knowledge rather than empirically. Three areas of physical polymer chemistry will be studied. (1) polymer-polymer interaction and miscibility. (2) the use of homodyne (laser-Raman) spectroscopy to determine diffusion, shape, molecular weight and distribution in solution. (3) calorimetric studies of transition phenomenon with emphasis on the nature of the glass transition. This study is particularly timely to the solution of Air Force problems in the area of the physical properties of new and improved solid propellants.

Supporting agency address information: AF Office of Scientific Research NC, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0007, DEVELOPMENT OF ALUMINUM/GRAPHITE COMPOSITES

A.P. LEVITT, U.S. Army, Materials & Mechanics Res. Ct., *Watertown, Massachusetts* 02172

To develop, for structural use in Army missiles and aircraft, graphite fiber reinforced aluminum by means of a graphite fiber reinforced magnesium precursor. Since graphite can be readily wet and bonded to Mg, and since Mg can be readily bonded to Al, the use of the Mg/g precursor eliminates the Al/g wetting and bonding problem.

Woven, Thornel 50 graphite fiber tape will be treated with Ti and infiltrated with molten magnesium. The process variables of time, temperature, and Ti concentration will be varied in order to optimize the infiltration of the Thornel 50 tape by the molten Mg. The resulting composite tape will then be sandwiched between two layers of Al foil and hot pressed under various conditions of temperature, pressure, and atmosphere to form Al/g composites, which will be evaluated for mechanical properties.

Supporting agency address information: AMC Materials & Mechanics Res. Ctr, Attn-AMXMR-EM, Watertown, Mass. 02172

SUPPORTED BY U.S. Dept. of Defense - Army

3.0008, ELECTROPHORESIS TECHNICAL EXPERIMENT

P.E. BIGAZZI, State University of New York, Graduate School, *Buffalo, New York* 14222 (NAS 6-31292)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0009, HEAT TRANSFER CHARACTERISTICS OF POROUS MATERIALS

A. DYBBS, Case Western Reserve Univ., School of Engineering, *Cleveland, Ohio* 44106 (NSG 3040)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0010, SURFACE ENERGIES AND RELATED PROPERTIES OF B-TITANIUM ALLOYS

R. SPEISER, Ohio State University, School of Engineering, *Columbus, Ohio* 43212 (AF-AFOSR-2799-75)

Important among the requirements needed to ensure improved performance and reliability of components used in flight

vehicles is the optimization of materials properties based upon sound theory and experimental data. The search for materials having better strength-to- weight ratios, toughness, and improved resistance to degradation is of obvious importance. This research is intended to obtain surface and grain boundary energy data that will contribute directly to the understanding of the mechanical behavior of a class of alloys, beta- titanium, that is currently being actively studied in other AF programs. These experiments will also further our understanding of the effects of the environment upon material properties and the effects of impurities and processing environment that are involved in creating extrusions and intrusions that lead to the development of surface fatigue cracks. Initial work will study Ti-25 Mo base alloys and the consequences of small alloying element additions.

Supporting agency address information: AF Office of Scientific Research NE, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0011, REGULATION OF THE INTERNAL OXYGEN AND ACID-BASE ENVIRONMENT
C.J. LAMBERTSON, Univ. of Pennsylvania, School of Medicine, *Philadelphia*, *Pennsylvania* 19104 (NSG 9011)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0012, SURVEILLANCE - INFRARED EMISSION FROM FUEL-OXIDIZER REACTIONS
M.A. BIONDI, Univ. of Pittsburgh, School of Arts, *Pittsburgh*, *Pennsylvania* 15213 (N00014-67-A-0402-0010)

Infrared emission from jet and rocket engines have 'signatures' characteristic of the engine. These signatures are useful in surveillance to identify the source. This study will attempt to identify some of the variables affecting the infrared signatures. Methods of changing the signatures will be considered.

The study of infrared emission from fuel-oxidizer reactions will be carried out in a special flow system which will simulate altitudes of 25 to 80 km. Spectral measurements will be carried out from 1.1 to 20 microns.

Supporting agency address information: Office of Naval Research 421, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0013, DEVELOP A SYNOPTIC IONIZATION MEASUREMENT SYSTEM
L.C. HALE, Penn. State University, School of Engineering, *University Park*, *Pennsylvania* 16802 (NAS 6-2602)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0014, PROCESSING VARIABLES WHICH AFFECT ADHESION OF ORGANIC COATINGS TO NAVAL AIRCRAFT
A.E. FEATHERSTON, Vought Aeronautics Company, *Dallas*, *Texas* 75222 (N00019-75-C-0087)

To establish the processing variables and the tolerances thereon associated with the preparation of metal aircraft surfaces for paint application and determine the relationship between theory and the properties of the subsequently applied organic coating, (including sealants) particularly as related to coating adhesion.

Variations in surface preparation will be studied by preparing specimens utilizing commonly-encountered processing conditions, such as anodizing, followed by the standard Navy aircraft finish system (as well as the finish system employing an elastomeric preseal). Quantitative adhesion measurements will be made after the finish system has cured to determine the acceptable spread of controllable conditions to achieve optimum properties of the finish system.

Supporting agency address information: Naval Air Systems Command, Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, CHEMICAL LASER ADVANCED NOZZLE DEVELOPMENT
UNKNOWN, Rockwell International Corp., *Canoga Park*, *California* 91304 (F29601-73-A-0034E)

To determine the optimum design proportions and scaling effects of a DF chemical laser using a three stream horizontal nozzle design. The horizontal nozzle has the following characteristics- 1) Only one two- dimensional expansion nozzle, aligned with the beam path, is used. 2) All the gases are injected in the transonic region. 3) Interface inert gas-diluent is injected between the fuel and the oxidizer in lieu of cooled walls with their attendant heat and recombination losses. The initial objective of this work is to determine the optimum passage width for the fuel, diluent, and oxidizer. Secondary objectives include the determination of the optimum operating pressures, expansion rates, and nozzle expansion contours.

Experimental determination of the effect from systematic variations in the nozzle design geometric proportions on closed cavity specific lasing power and lasing zone. For these tests a series of nozzles will be designed and tested. Each nozzle will be tested by varying separately, the inlet pressure to the fuel, diluent, and the oxidizer. Closed cavity lasing efficiency will be used as the criteria for determining the optimum running conditions. The initial design will attempt to bracket the range of performance and subsequent designs will attempt to determine the optimum proportion. If the results warrant it, the results will be projected into preliminary designs of a medium and large power devices.

Supporting agency address information: AF Weapons Laboratory ALD, Kirtland AFB, New Mex. 87117

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0002, HIGH POWER SPARK GAP SWITCH DEVELOPMENT
W. CLARK, Maxwell Laboratories Inc., *San Diego*, *California* 92123 (F33615-74-C-2027)

The objective of this program is to analytically and experimentally investigate spark gap devices for possible use as high energy high- repetition-rate, pulsed power switches. It is the purpose of this program to assess the technology and determine if spark gaps can be developed for lightweight and reliable switches which can handle tens of kilojoules at hundreds of pulses per second. Other switches, such as thyratrons, mechanically actuated or solid state devices, all possess weight, reliability, or environmental restrictions for the power and repetition rates required.

The program will consist of two (2) phases- (1) a state-of-the-art technology assessment phase and (2) a device fabrication and test phase. The test portion of the program necessitates that the contractor have access to adequate test facilities and equipment.

Supporting agency address information: AF Aero-Propulsion Laboratory POD, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0003, POWER AMPLIFIER MODULES
V. GARBUSHIAN, Power Hybrids Incorporated, *Torrance*, *California* 90501 (N62269-73-C-0657)

To develop a 250 watt peak pulse power amplifier module that can be used as a building block in a 1000 watt amplifier for TACAN, IFF and new links in the LX-band. This contract supports work unit DV 701, agency accession no. DN 233250.

A contract for a single emitter ballasted multicell transistor utilizing gold metalization was awarded in June 1973. The transistor along with matching 50 ohm input and output networks was to be placed in a 5 cu in. module. Contract calls for delivery of 12 modules.

Supporting agency address information: Naval Air Development Center, Aero Electronic Technology Dept. (2031), Warminster, Pennsylvania 18974

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0004, STUDY OF EDUCATIONAL SATELLITE COMMUNICATIONS DEMONSTRATION--ALASKA
A. FEINER, Practical Concepts Inc., *Washington, District of Columbia* 20036 (NIE-C-74-01480)

Under this project an assessment and analysis of the Alaskan component of the Educational Satellite Communications Demonstration will be conducted. This will be accomplished through (1) project documentation and analysis, (2) data collection, and (3) policy analysis. More specifically, this assessment shall consist of an analytic description of the events before, during, and after the demonstration--with primary emphasis upon the uses of satellite educational television in remote and isolated rural communities. Data will be collected from all available sources including the Alaska Native Language Center, the Indian Mental Health Program, the Center for Northern Educational Research, and other Alaskan organizations. Data arising from isolated rural communities will be obtained through maximum feasible use of trained Native Alaskan interviewers and collectors. Following the conclusion of the demonstration, the contractor will prepare documentary summaries of the events of the demonstration and conduct policy analyses which will assist in determining the impact of satellite communications to the educational community. (Author)

SUPPORTED BY U.S. Dept. of Hlth. Ed. & Wel. - N.I.E.

4.0005, SURFACE AND BULK ELECTRONIC PHENOMENA IN SOLIDS
C.T. SAH, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801 (AF-AFOSR-2067-71)

Air Force communications, data processing, and remote sensing are but a few examples of critical avionics needs for advanced aerospace systems. In solid state electronic devices, which form the backbone of such systems, it is well known that surface and interface states play a dominant role in the stability and reliability of silicon bipolar and metal-oxide-semiconductor (MOS) transistors and integrated circuits. Surface states contribute to the noise, interference and failure of electronic devices. An understanding of the effects of surface states on device reliability will suggest ways to improve device performance under adverse environments, such as high temperature and intense ionizing and nuclear radiation. Research this year will focus on, determining the electronic properties, generation, and annealing kinetics of oxygen deficient states, studying the effects of surface roughness scattering and the effect of high electric field on MOS transistor performance.

Supporting agency address information: AF Office of Scientific Research NE, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0006, EVALUATE DATA LINK INPUT/OUTPUT DEVICES
UNKNOWN, Arinc Research Corporation, *Annapolis, Maryland* 21401 (048725 (TRAIS NO.))

The objective of this procurement is to evaluate candidate cockpit Input/Output (I/0) devices for air-ground-air data link application in the more realistic and sophisticated environment of commercial airplane simulators. A further objective is to expose a significant number of air carrier pilots to the data link concept by participation in the airline simulator experiments and obtain their opinions and suggestions regarding data link hardware and procedures within the cockpit of modern commercial aircraft.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

4.0007, SOLAR EUV SPECTROMETER
J.P. PADUR, Comstock & Wescott Inc., *Cambridge, Massachusetts* 02138 (F19628-73-C-0253)

AF function - surveillance, detection, guidance-control, tracking, interception, and communications in the aerospace medium. Deficiency - vehicle trajectories and transmission of radio waves cannot be reliably predicted for variable conditions of solar inputs affecting the various physical properties of the aerospace medium. Research - satellite and rocket measurements of solar ultraviolet fluxes above and within the earth's upper atmosphere. How research contributes - establishes average levels as well as variabilities of solar UV fluxes in relation to other solar and atmospheric parameters. Contractor performs design, development and construction of instrumentation for space vehicle experiments to determine solar extreme ultraviolet photon fluxes. Specifically requires design and construction of spectrometers for use in rocket-borne experiments for the measurement of absolute solar photon fluxes and their absorption in the upper atmosphere.

Supporting agency address information: AF Cambridge Research Laboratories LK, L. G. Hanscom Field, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0008, LOW COST DIGITAL AVIONICS
L.L. GILBERT, J L M International Inc., *Cambridge, Massachusetts* (F33615-74-C-1199)

To demonstrate that it is technically feasible and reasonable to meet or exceed the weapon system performance characteristics presently required with a low cost digital system.

The approach to be taken to achieve the demonstration will be first to ground test the contractor-furnished equipment and compare its performance with known performance of existing systems against the same simulated missions. Then the demonstration will be carried to the flight stage in which comparisons will be made between the contractor-furnished equipment and existing A/C equipments.

Supporting agency address information: AF Avionics Laboratory AAA, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0009, HYDROFLUIDIC FLY-BY-TUBE FLIGHT CONTROL SYSTEM
J. HEDEEN, Honeywell Incorporated, *Minneapolis, Minnesota* 55413 (N00019-75-C-0169)

The objective of this program is to demonstrate the feasibility of a hydrofluidic fly-by-tube flight control system.

This shall be done by fabrication and test of a fluidic backup concept.

Supporting agency address information: Naval Air Systems Command, Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0010, LINEAR SUPERSONIC TURBULENCE OF GASES
J. KISTEMAKER, F O M Inst. Voor Atoom En Mol., *Amsterdam, Netherlands*

Historical: Since 1955 research of the FOM-Institute are working on gas dynamics and magnetohydronamics (ultra centrifuge, turbulent (rotating, plasmas).

Current situation: The research team on magnetohydrodynamics consists of 8 university graduates and 8 technicians. The gas dynamic part of the project has been finished this year. So there is capacity to accept a new project, based on the large know-how of this Institute.

Interests: a) Formation of an artificial wall of dense gase (confinement of thermo-nuclear plasmas in fusion reactors). b) Separation of light and heavy isotopes: 1) Enrichment of nuclear fuel (e.g. U 235 F6 and U 238 F6); 2) Radioactive waste management (e.g. two important problems in the fuel cycle: Kr85, half-life 10 years, and Cs137, half-life 30 years); 3) Precipitation of dust in industrial processes. c) Research on supersonic aerodynamics. d) Focussing divergent relativistic electron-beams, in order to activate the fusion of thermo-nuclear plasmas. e) Inverse gas core fission reactor, an interesting alternative of the NASA gas core reactor.

SUPPORTED BY Found. For Fund. Res. on Matter - Utrecht

4.0011, INVESTIGATION REGARDING THE UTILIZATION OF WIND POWER APPLYING AEROTURBINE GENERATORS BUILT ON ARTIFICIAL ISLANDS

N. FEIS, Central Technisch Inst. T N O, *Apeldoorn, Netherlands*

Within the framework of investigations on windpower utilization (by means of aeroturbogenerators built on artificial islands) wind tunnel experiments are performed concerning: a) The perturbation of the wind profile by an aeroturbine; b) The optimal configuration of a set of aeroturbines for the utilization of the windpower.

SUPPORTED BY Org. For Industrial Res. T N O - the Hague

4.0012, INVESTIGATION CONCERNING THE POSSIBILITIES OF PREVENTING OSCILLATIONS OF CHIMNEYS, BUNDLES OF PIPES, PILES OF DRILLING PLATFORMS ETC.

N. FEIS, Central Technisch Inst. T N O, *Apeldoorn, Netherlands*

Within the frame work of investigations concerning the possibilities of preventing oscillations of chimneys etc. (caused by Von Karman's eddies in the passing fluid flows), experiments are performed with cylindrical models, in water or wind tunnels. It is examined if by the fitting of vortex generators the coordinated shedding of eddies over long pipe lengths can be prevented.

SUPPORTED BY Org. For Industrial Res. T N O - the Hague

4.0013, WIND TUNNEL STUDIES OF AERO-OPTICAL INTERACTIONS

T.F. JERRICK, U.S. Air Force, Weapons Laboratory, *Albuquerque, New Mexico* 87117

The objective of this effort is to gain an understanding of the interaction between an optical beam and an aerodynamic flow field such as exists around an aircraft. The degradation of an optical beam propagating through the atmosphere from an aircraft arises primarily from the flow field around the aircraft, up to quite long ranges. A detailed understanding of these effects is lacking. Moreover, what experimental data exists shows a lack of correlation between wind tunnel model results and measurements made in flight. This effort aims both to develop a thorough theoretical and experimental understanding of the aero-optical interaction, and to determine scaling laws between wind tunnel and in-flight results.

The approach to be taken in this effort is to first perform detailed and exhaustive studies of the aero-optical interaction using simple wind tunnel models. The aerodynamic parameter characterizing the flow around the models will be measured in detail, and correlated with the observed degradation of a laser beam propagating across the flow. The aerodynamic parameters to be investigated include the thickness of the turbulent boundary layer, the scale size of turbulence, separated and shear layer flow, oblique shock waves, and steady state (potential flow) density gradients. Optical measurements will include modulation transfer function, point spread function, intensity scintillation, angle of arrival fluctuation, and induced steady state aberrations. The experimental efforts will be conducted as a joint Air Force-NASA effort at the NASA/Ames Research Center. Concurrently, theoretical studies will be undertaken to determine the scaling of the aero-optical effects between wind tunnel models, experiments, and aircraft flight experiments. The wind tunnel measurements described above will serve as input to this theoretical study. Additional experimental input and verification will come from airborne propagation experiments undertaken by the AFWL in a separate program. Finally, scale models of aircraft turrets will be investigated in wind tunnels to both verify the theoretical analyses developed and to optimize optically the turret design. The program is primarily in-house. Contractor support will be required for design and construction of wind tunnel models.

Supporting agency address information: AF Weapons Laboratory ALO, Kirtland AFB, New Mex. 87117

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0014, DYNAMIC INSTABILITY OF DUCTS CONVEYING FLUID

Y.Y. YU, Polytechnic Inst. of New York, Graduate School, *Brooklyn, New York* 11201 (NSG 1105)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0015, FLUX PINNING AND CRITICAL CURRENTS IN A-15 SUPERCONDUCTORS

J.D. LIVINGSTON, General Electric Company, *Schenectady, New York* 12305 (F44620-75-C-0044)

High temperature superconducting materials are needed for application in airborne multi-megawatt power generation and conditioning systems. Research specifically directed toward the synthesis and characterization of high transition temperature metallic compounds can provide a greater margin of design efficiency and operational reliability than presently available superconductors. The performance of high field magnets and solenoids, electric motor windings, superconducting rotors in power generators, transformers and induction energy storage systems could be significantly improved if the upper critical field, the current-carrying capacity and the critical transition temperature of the superconducting material could be enhanced. In addition, AC power distribution losses, transients and mechanical breakdown of the superconductor need to be reduced. This research involves the synthesis and preparation of binary and ternary A- 15 metallic compounds for the purpose of studying flux-pinning mechanisms in practical superconductors. Improved understanding of the relationship of microstructural in homogeneities such as grain boundaries, precipitates, dislocations, etc. Should lead to greater control of the magnetic field and temperature dependence of the current- carrying capacity of these superconducting materials. It could also lead to reducing transient losses and to increasing current densities in multifilamentary A-15 superconducting wires and cables.

Supporting agency address information: AF Office of Scientific Research NE, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0016, THEORETICAL STUDY OF HETEROJUNCTION AND GRADED BAND GAP TYPE SOLAR CELLS

J.R. HAUSER, Univ. of North Carolina, School of Engineering, *Raleigh, North Carolina* 27600 (NSG 1116)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0017, COMPUTATIONAL FLUID DYNAMICS

W.L. HANKEY, U.S. Air Force, Aerospace Research Labs., *Dayton, Ohio*

AF function - aircraft and missiles. Deficiency - lack of accurate aerodynamic prediction methods for the design of future USAF systems. Research - develop three-dimensional numerical methods applicable throughout the flight corridor to solve the set of partial differential equations for fluid mechanics. How research contributes - the current design technique for developing a new USAF system requires approximately 20,000 wind tunnel test hours, $50 million, and takes 4 years to accomplish. Use of numerical methods in the various phases of design can dramatically shorten this cycle.

In the past decade remarkable advances have occurred in the numerical computation of fluid flows. Advances in both computation methods and computer hardware have made this progress possible. The approach will be to develop numerical codes to efficiently solve various forms of the Navier-Stokes equations on the advanced computers.

Supporting agency address information: Aerospace Research Laboratory LH, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0018, PERIODIC REPRESENTATIONS FOR THE STATE EQUATIONS WITH APPLICATIONS TO THE CONTROL OF ENVIRONMENTAL SYSTEMS

R.J. MULHOLLAND, Okla. St. Univ., School of Engineering, *Stillwater, Oklahoma* 74074

This research is concerned with the analysis of mathematical models of engineering systems which vary periodically on some

fixed time scale with the objective of providing greater insight into the fundamental engineering problems of stability, control, and computation for natural systems. The main thrust of the applications concerns the development of new methods for representing and controlling models of environmental systems. It is well known that the state equations for environmental systems vary periodically, and that management schemes are intuitively conceived to operate on commensurate periodic time scales. Thus, it is suggested that the theory of periodic representations can be employed to develop new optimal control strategies for these systems. The research will be directed toward a basic theoretical understanding of the theory of stability as employed in ecosystem analysis.

SUPPORTED BY U.S. Natl. Science Foundation

4.0019, ASSESSMENT OF SEVERE-STORM ATMOSPHERIC DATA NEEDS RELATIVE TO AIRBORNE PLATFORM REQUIREMENTS
E.J. PYBUS, Okla. St. Univ., Graduate School, *Stillwater, Oklahoma* 74075 (NAS 5-20735)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0020, NAVY ENVIRONMENT: PHYSICS OF THE AIR-SEA INTERFACE
C.A. PAULSON, Oregon State University, School of Science, *Corvallis, Oregon* 97331 (N00014-67-A-0369)

The objective of this task is to obtain a better understanding of the physical processes occurring at the air-sea interface and in the adjacent atmospheric and oceanic boundary layers. Such an understanding is required if we are to improve our capability for forecasting (1) electromagnetic propagation conditions in the atmospheric boundary layer--needed for ship radars, (2) sound propagation conditions in the oceanic boundary layer or mixed layer--needed for ship sonars, and (3) surface wave and fog conditions--needed for general ship and carrier operations.

Under varied wind speed regimes, simultaneous measurements will be made of the fluxes of momentum, heat, and moisture both in the atmospheric and oceanic boundary layers. These measurements will help clarify the relations between the generation of surface waves and wind- drift currents, the deepening of the mixed layer, and the formation of turbulence.

Supporting agency address information: Office of Naval Research, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0021, LARGE-SCALE WAVELIKE EDDIES AND THEIR NEAR AND FAR JET NOISE FIELD
J.T. LIU, Brown University, School of Medicine, *Providence, Rhode Island* 02912 (NSG 1076)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0022, STUDY OF LIGHTNING ARRESTER SPACING AS RELATED TO PERFORMANCE OF UNSHIELDED LINES
K.E. LLOYD, Southwestern Public Serv. Co., *Amarillo, Texas* 79105

Description: This study is to determine the optimum spacing of lightning arresters on distribution lines and to compare the economic cost of this spacing with the economic cost of rebuilding non-shielded lines to a shielded design. Lightning arresters applied to distribution lines improve the lightning performance of these lines. Whether the cost of a shielded line is less or greater than the cost of rebuilding a line to shielded design is to be determined.

Surge arresters have been installed on a test line section. Instruments have been installed to monitor the performance of the test line, a comparable non-protected line, and a shielded line. Data will be collected and recorded over a five year period to evaluate the performance of the three lines.

SUPPORTED BY Southwestern Public Serv. Co. - Amarillo

4.0023, SQUARE-WAVE CIRCUMFERENTIAL PRESSURE DISTORTION EFFECTS IN COMPRESSORS
R.E. PEACOCK, Cranfield Inst. of Technology, *Bedford, England, United Kingdom* (AF-AFOSR-2708-74)

Circumferential pressure distortions at the inlets to compressors often have a powerful effect upon compressor performance and can induce surge. A method does not exist for reliably predicting the transient aerodynamics leading to reduced compressor performance for gas turbine engines. The research proposed involves the measurement of the transient aerodynamic behavior around compressor blades in a square-wave distortion, with particular interest in the behavior of the rotor blades. The compressor to be used will be a single stage low speed machine of 20.0 inches diameter, instrumented to measure and transmit instantaneous rotor blade surface pressures as well as determine overall performance characteristics. This unique instrumentation technique has been successfully developed at Cranfield. This could potentially lead to development of an improved design method for accounting for the effects of inlet circumferential pressure distortions on compressor performance.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production And Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, HIGH-LATITUDE IONOSPHERIC SOURCES OF AURORAL INFRASONIC & ATMOSPHERIC GRAVITY WAVES
R.D. HUNSUCKER, Univ. of Alaska, Geophysical Institute, *Fairbanks, Alaska* 99701

This grant supports an experimental evaluation of the relative importance of various auroral zone ionospheric source mechanisms which may generate auroral infrasonic waves (AIW) or acoustic-gravity waves (AGW). A unique array of auroral ionospheric sensors is available for this investigation, including, the Chatanika incoherent scatter radar, all-sky cameras, spectrophotometers, magnetometers, riometers, an ionosonde, and image orthicon television systems. A large collection of data from the foregoing instrumentation array plus AIW infrasonic sensors in Alaska and AGW HF Doppler systems at midlatitudes is available for analysis. New data will also be acquired during the daily and seasonal occurrence maxima for AIW's and AGW's, using the most appropriate instrument operating modes. Expected results include assessing the relative effectiveness of the Joule dissipation and Lorentz force contributions as well as supersonic 'bow wave' generating mechanisms. The distinguishing characteristics of the particle precipitation events and electrojet variations which produce AIW's and AGW's will be sought.

SUPPORTED BY U.S. Natl. Science Foundation

5.0002, REMOTE SENSING RELATED TO THE FOREST ENVIRONMENT (FIR, FSUR)
R.C. HELLER, U.S. Dept. of Agriculture, Pac. Sw. For. & Rg. Expt. Sta., *Berkeley, California* 94701 (PSW2251(FIR))

OBJECTIVE: Study energy radiation patterns of resource and environmental components, and develop remote sensing technology to meet data needs for resource management.

APPROACH: Assess and adapt sensing techniques for resource inventories emphasizing small scale imagery and photo measurements. Study photographic, photographic I.R., and thermal portions of spectrum for recognizing stress in vegetation. Includes histology of needles, transpiration, and heat measurements of healthy and dying trees. Develop target signatures from reflectance associated with shadows, ground cover, sun angles and polarization effects. Exploit measurement devices such as aerial films, cameras, and microdensitometers. Explore techniques for automated image interpretation.

PROGRESS: Automatic photo interpretation of range communities by use of a microdensitometer scanning color infrared

aerial photos showed that in a Colorado pinyon pine-juniper plant community individual shrub and tree species could be accurately separated. Image density alone separated six general plant communities: ponderosa pine, spruce-fir, big sagebrush, native grasslands, and seeded grasslands. Airborne multispectral scanners offer a means for computer classification of forest land. Over a 42-square-kilometer test site, accuracies ranged from 15-90 percent (overall 61 percent). This is a great improvement over earlier attempts. Remote telemetering of spectral reflectance data to satellites is feasible and may be practical for many Forest Service applications in the future. The data collected in this experiment was used to correct for atmospheric losses in the visible part of the spectrum.

SUPPORTED BY U.S. Dept. of Agriculture - F.S.

5.0003, REGIONS OF DETACHED PLASMA IN THE OUTER MAGNETOSPHERE
M.G. KIVELSON, Univ. of California, Graduate School, *Los Angeles, California* 90024

The proposed investigation is a study of both the microscopic and macroscopic behavior of the magnetospheric plasma which will focus on the isolated regions of enhanced plasma density that have been found in the outer magnetosphere, and a study of the associated magnetospheric electric field. The steep gradients of plasma density on the edges of these regions yield evidence of the dependence of plasma instabilities on changes in plasma density.

The investigation consists of an analysis of many such regions using data from a variety of satellite-borne instruments principally those carried on the OGO-5 spacecraft and from ground stations which have previously been acquired directly from the principal investigators, through the National Space Science Data Center, and through the World Data Center.

SUPPORTED BY U.S. Natl. Science Foundation

5.0004, REGIONAL SLOPE STABILITY STUDIES
D.H. RADBRUCHHALL, U.S. Dept. of the Interior, Geological Survey, *Menlo Park, California* 94025

States to which project pertains: California and Pennsylvania.

Topical study to determine regional geologic factors that contribute to land-sliding in selected areas of the United States. Areas are being studied in Northern Coast Ranges and the Transverse Ranges of California, and in the vicinity of Pittsburgh, Pennsylvania. Principal objectives are to determine which regional geologic factors (as opposed to local factors triggering individual slides) or combination of factors are critical in determining regional slope stablity, so that these factors can be taken into account in planning and construction, particularly of large projects. The work consists of literature search covering all pertinent data on such factors as climate, slope, tectonic and geologic history, and erosion rates; aerial photograph studies to map distribution of landslides in study areas; examination of selected landslides on the ground to determine their characteristics; and field examination of geologic units in study areas to determine their pertinent physical properties, including composition, weathering, permeability, and state of fracturing. The study may involve measurements of state of stress in the earth's crust and its relationship to regional landslide patterns.

SUPPORTED BY U.S. Dept. of Interior - Geological Survey

5.0005, MAGNETOSPHERE-IONOSPHERE COUPLING
R.A. HELLIWELL, Stanford University, Graduate School, *Palo Alto, California* 94305

This grant supports theoretical and experimental work on several aspects of magneto-sphere-ionosphere coupling. The experimental work involves analysis of existing data and data that will become available through other programs. Whistler data from Stanford programs at Siple, Antarctica and Roberval, Canada will be used to obtain information on the magnetospheric plasma. The information on the underlying ionosphere will come from a number of sources of data including ionosondes, incoherent scatter radars, and satellite-borne probes. The theoretical work involves computer studies of magnetosphere-ionosphere coupling through interchange of thermal plasma and precipitation of energetic particles. The proposed program of research includes the following topics: 1) cool plasma flow between the ionosphere and magnetosphere, 2) substorm effects on a coupled ionosphere-magnetosphere system, 3) distribution of cool plasma along geomagnetic field lines, 4) theoretical studies of the coupled ionosphere-magnetosphere system, 5) the reference plasmasphere, and 6) magnetosphere-ionosphere coupling through energetic particles.

SUPPORTED BY U.S. Natl. Science Foundation

5.0006, TO ESTABLISH A VHF AURORAL RADAR AT SIPLE, ANTARCTICA
B.B. BALSLEY, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302

It is proposed to design and fabricate a 50 MHz radar aurora back scatter facility which is capable of operating in the semi-automatic made for the purpose of adding this technique to the magnetosphere- ionosphere measurements being made at Siple Station and at its geomagnetic conjugate. Since this will be the first time to operate this equipment in this mode and in extreme cold, it may be necessary to design a new, more reliable transmitter and pulse circuitry and to consider cold weather effects on the unique coaxial antenna. The task appears challenging but straightforward. After successful testing the equipment will be installed at Siple in the second year and will be used to obtain amplitude and spectral characteristics of the radar aurora in the southern auroral region.

SUPPORTED BY U.S. Natl. Science Foundation

5.0007, RADIO BEACON EXPERIMENTS
M. SCHERER, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302

Objective: Conduct radio beacon experiments aboard NASA's geostationary satellite ATS-F to gain more knowledge on geomagnetic storms and solar flares.

Plan: (1) Finish the construction of the phase locked receiver system. This system is an adapation of the Boulder system. (2) The finished system will make following measurements: Faraday rotation at 40, 41 and 140 MHz; group delay of 1 MHz modulation at 140/360 MHz; differential phase at 40/360 MHz. (3) Collaborate with Boulder group on studies of magnetic storms and certain observations of traveling disturbances.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0008, CHARGE COMPOSITION STUDIES THROUGHOUT THE MAGNETOSPHERE/IONOSPHERE SYSTEM
D.J. WILLIAMS, U.S. Dept. of Commerce, Engineering Research Lab., *Boulder, Colorado* 80302

This grant will support reduction and analysis of data available at NOAA. These results will be employed in the general International Magnetospheric Studies Program.

SUPPORTED BY U.S. Natl. Science Foundation

5.0009, SKYLAB - GREAT PLAINS AND ARIZONA
R.B. MORRISON, U.S. Dept. of the Interior, Geological Survey, *Denver, Colorado* 80225

States to which project pertains: Illinois, Iowa, Missouri, Kansas, Nebraska, South Dakota.

This project is testing the applicability of Skylab photographs for synoptic identification and mapping of geologic and geomorphic units in the Midwest-Great Plains, including end moraines of the last glaciation, relicts of ancient (middle and early Pleistocene) moraines and filled valleys, and terrace sequences. Clues relating to these features are being sought on the EREP photographs and compared with their expression on ERTS-1 images and ultrahigh (U-2 and RB-57) airphotos. The project involves the active participation of six State Geological Surveys, those of Illinois, Iowa, Kansas, Missouri, Nebraska, and South Dakota. Much of the information obtained has important application to environmental- geologic problems, such as

development of ground water, regional land- use planning, and location of construction materials.

Also, in southern and central Arizona, Skylab photographs are being evaluated to determine their utility for mapping the effects of the present episode of accelerated erosion (which began about 1890) and for mapping ancillary data relevant to the erosion problem. Maps of modern erosion features, potential erodibility of soils, channel depths, slope- relief, and geomorphology are being prepared for various areas representative of different climatic, relief, vegetation, soil, and geologic conditions.

SUPPORTED BY U.S. Dept. of Interior - Geological Survey

5.0010, MAINTENANCE AND FLIGHTS OF BALLOON-BORNE STRATOSPHERIC MEASURING PACKAGE
D. MURCRAY, Univ. of Denver, School of Arts, *Denver, Colorado* 80210 (DAAD05-75-C-0795)

To use several measuring packages which have already been built by the contractor to make in situ balloon-borne measurements of the minor constituents, both ions and neutral molecules, of the stratosphere. The contractor will maintain and fly these packages.

The contractor will prepare existing balloon-borne infrared and mass spectrometer packages for balloon flights, fly the packages, and reduce and analyze the data. There can be a reasonable amount of rebuilding and/or modification of the packages, but the contruction of wholly new instruments is not included. Two ballooning expeditions are planned for FY75, one for the continental United States in the fall of 1974 (designated COSMEP II), and one in the Fairbanks, Alaska, area in the spring of 1975 (COSMEP III). COSMEP III is contingent on the receipt of additional funding.

Supporting agency address information: AMC Ballistic Research Laboratories, Aberdeen PG, Md. 21005

SUPPORTED BY U.S. Dept. of Defense - Army

5.0011, SOLRAD (SOLAR ACTIVITY SATELLITE MONITORING AND FORECASTING)
E.W. PETERKIN, U.S. Navy, Research Laboratory, *Washington, District of Columbia* 20390

The SOLRAD program objectives are to monitor solar X-ray, ultraviolet, and particle emission and to process telemetered data in real-time so that timely predictions can be provided of solar activity capable of disrupting ionosphere-dependent military systems.

Current efforts to understand solar activity are based on observations made above the absorbing layers of the atmosphere Y satellite solar UV and X-ray detectors. Studies to improve the definition of the disturbance, describe solar X-ray spectra and their relation to solar activity, the time history of X-ray emission from solar flares, and the location, size and features of the X-ray emitting regions. Two satellites at 69,000 n.mi. and two ground stations are planned to provide continuous real-time monitoring of solar electromagnetic radiation and particle emission outside the disturbance of the earth's magnetosphere.

Supporting agency address information: Naval Air Systems Command, Space Technology Division (AIR-370C-1), Washington, D.C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

5.0012, ENERGY CONVERSION AND ENVIRONMENTAL SUPPORT TECHNOLOGY - THE RADIATION ENVIRONMENT AND ITS EFFECT ON MILITARY SYSTEMS
M.M. SHAPIRO, U.S. Navy, Research Laboratory, *Washington, District of Columbia* 20390

(1) To make military communications more reliable by acquiring data that will improve the predictability of magnetic storms, polar blackouts, and the interruption of communications during solar flares. (2) To provide timely advice and assistance to NRL scientists and engineers working on those military problems in which knowledge of high energy physics and its specialized experimental techniques is essential, together with expertise on radiation backgrounds.

Sensitive detection systems are sent aloft in balloons and satellites to study the composition, production mechanisms, and sources of the various components of the high energy radiations impinging on earth. Accelerator produced heavy ion beams are used for calibration.

Supporting agency address information: Naval Research Laboratory (7000), Washington, D.C. 20375

SUPPORTED BY U.S. Dept. of Defense - Navy

5.0013, EQUATORIAL IONOSPHERIC STUDY
J.R. KOSTER, Univ. of Ghana, *Accra, Ghana* (AF-AFOSR-2628-74)

AF function- communications and navigation. Deficiency - fading and pulse delays. Research - provides observations of equatorial signal disruption. How research contributes - data used in global model now in process. This work helps furnish the equatorial ionospheric parameters used in the ionospheric physics laboratory global ionospheric model. These parameters (size, shape, velocity, diurnal and seasonal occurrence of ionospheric irregularities) are the basis of prediction of the disruptive effects on radiowave propagation. Recent work from the contractor established a correlation between diurnal patterns of polarization rotation and irregularity structure causing fading.

Supporting agency address information: AF Cambridge Research Laboratories LI, L. G. Hanscom Field, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0014, IONOSPHERIC RANGE ERROR
K.C. YEH, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801 (F19628-74-C-0044)

AF function - advanced navigation and radar systems. Deficiency - exospheric electron content produces timing delays. Travelling ionospheric disturbances produce errors in ionospheric prediction models. Research - make calculations of exospheric time delays for world-wide locations. Summarize the state of knowledge of travelling ionospheric disturbances and perform theoretical calculations on the f- region behavior. How research contributes - improve accuracy of navigation and radar systems which must traverse the ionosphere and exosphere. Study the relationship between the ionosphere and the exosphere and determine the unknown contribution of the exosphere to time delays.

Supporting agency address information: AF Cambridge Research Laboratories LI, L. G. Hanscom Field, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0015, LOW LATITUDE TOTAL ELECTRON CONTENT AND IRREGULARITY STUDIES
J.N. BHAR, Univ. of Calcutta, *Calcutta, West Bengal, India* (AF-AFOSR-2142-71)

AF function - communications, radar and navigation. Deficiency - lack of knowledge of ionospheric parameters yields excessive errors in pulse delay and refraction. Research - this work records ionospheric morphology. How research contributes - this work uses signals from transmitting satellites to predict the behavior of VHF transionospheric propagation in the vicinity of the equatorial anomaly during the decreasing sunspot cycle. Using signals from synchronous and asynchronous satellites, the total electron content and irregularity structure of the equatorial ionosphere will be studied. The intent of the study will be to predict the behavior of VHF transmissions from satellites in the vicinity of the equatorial anomaly during the decreasing solar cycle.

Supporting agency address information: AF Cambridge Research Laboratories LI, L. G. Hanscom Field, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0016, THEORY OF HIGH TEMPERATURE PLASMAS
R.C. DAVIDSON, Univ. of Maryland, Graduate School, *College Park, Maryland* 20740 (ORO-AT(40-1)4513)

The program involves theoretical research on the equilibrium, stability and dynamic behavior of magnetically-confined high-temperature plasmas. The proposed research includes kinetic studies of the Vlasov equilibrium and stability properties of linear theta-pinch configurations, and the development of a hubrid kinetic model (Vlasov ions and drift-kinetic electrons) that is amenable to equilibrium and stability analysis in complex (e.g., toroidal) field geometries. Also proposed are basic nonlinear studies essential to the understanding of turbulent heating and transport in theta-pinch plasmas, including nonlinear studies of energy isotropization via electromagnetic instabilities (e.g., electron whistler and mirror instabilities) that may result from preferential heating perpendicular to the magnetic field during implosion, and studies of anomalous heat loss along the field lines in finite-length turbulently heated plasmas including the effects of convection as well as conduction on the turbulent transport properties. This proposal also requests funds to continue fluid- numerical studies of theta-pinch implosion dynamics and sheath stability. These studies will include investigations of the implosion dynamics for parameters appropriate to Scyllac and the University of Maryland theta-pinch experiments, and further studies of the stability properties of equilibrium sheath configurations to determine the scaling of the (stable) sheath width with plasma Beta and density. Close contact will be maintained with the Scyllac program at LASL throughout these investigations.

SUPPORTED BY U.S. Atomic Energy Commission

5.0017, HAES/BIAS/HIGH ALTITUDE EFFECTS STUDIES/BALLOON INFRARED AURORAL SPECTROSCOPY
E.V. LOEWENSTEIN, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts*

AF function - surveillance, targets and backgrounds. Deficiency - incomplete knowledge of sky background radiation, particularly infrared. Research - measurement of radiations from disturbed atmospheric conditions, particularly aurora. How research contributes - supplies basic data on far infrared emissions from auroral conditions. Cooled spectral instruments are to be flown on a balloon-borne gondola, and directed at visual aurora. These instruments are to be flown from Fort Wainwright, Alaska. The initial experiments are to be balloon-borne measurements only, but eventually experiments are planned with coordinated balloon measurements and direct rocket-borne sampling of the auroral zone being observed from the balloon. Visible and near IR photometers will be flown on the balloon for purposes of comparison with known auroral characteristics.

Supporting agency address information: AF Cambridge Research Laboratories OP, L. G. Hanscom Field, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0018, SATELLITE MEASUREMENTS OF SOLAR UV
J.E. MANSON, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts*

AF function - vehicle tracking during flight and re-entry, trajectory prediction, communication systems. Deficiency - insufficient data to allow accurate modelling of the average composition and structure of the upper atmosphere and of the ionosphere, and to predict the response of the atmosphere and ionosphere to temporal variations in the solar input. Objective - determine the importance of the solar radiation within the spectral range from 140 to 1850 angstroms in maintaining the composition and thermal structure of the upper atmosphere. Develop a set of indices characterizing the temporal variation of this solar radiation, which is the putative cause of the variations in the atmospheric composition, density and thermal structure. How research contributes - measurements of this solar radiation are made eleven times a day, at various latitudes, longitudes and solar zenith angles. The measurements are continued through many solar rotations, and are to be examined in correlative studies with other observed effects. Atmospheric composition, density and temperature are measured by analysis of the attenuation profiles of selected solar emission lines during perigee passes and at sunrise and sunset.

Specially designed grazing incidence spectrometers are mounted on a solar oriented platform on the NASA Atmosphere Explorer series of satellites. These instruments cover the spectral range from 140 to 1850 angstroms, and each is made up of 24 individual spectrometers, multiplexed onto 12 detectors. The satellite contains an apogee motor, so that perigee passes down to 120 km can be maintained by an occasional apogee burn. The low perigee allows the study of attenuation of the solar radiation in certain emission lines, from which composition, density and temperature of the upper atmosphere may be derived. Above the attenuation region, but below the energetic particle belts, unattenuated incident solar flux data is required (11 measurements per day). During sunrise and sunset at the satellite, the occultation of the sun by the upper atmosphere allows analysis of the atmosphere remote from and below the satellite orbit. Some of the spectrometers which take data in spectral regions absorbed at very low altitudes in the atmosphere have been especially designed to optimize this sunrise-sunset opportunity. Three separate orbit orientations are planned. The first is at 60 degree inclination, and the second is to be a near polar orbit. (Text Abridged)

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0019, CHEMISTRY OF THE UPPER ATMOSPHERE
S.P. ZIMMERMAN, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts*

AF function - communications and satellite surveillance. Deficiency - inadequate knowledge of the atmosphere, particularly for determining the effects of natural or man-made disturbances. Objective - to measure turbulent and laminar transport coefficients in the upper atmosphere and develop improved theoretical model atmospheres of neutral and ionic composition. How research contributes - following solar proton events and nuclear detonations, radio communications are interrupted and missiles and satellite are lost from radar view. Improved models which can predict ionospheric perturbation effects can aid in the communications with and tracking of airborne vehicles and missiles during these events.

Computer codes have been expanded to include nitrogen and ionic species as well as dynamic mechanisms and will be used to generate theoretical atmospheric models. These models will be extended to include heat, momentum and energy transfer as well as solar and dynamic heat sources. Meridional circulation will also be incorporated into these models, based upon the latitudinal differential spatial heating due to the solar and dynamic mechanisms operative in the atmosphere.

Supporting agency address information: AF Cambridge Research Laboratories LK, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0020, IONOSPHERE MAGNETIC STORMS
M.J. MENDILLO, Boston University, School of Engineering, *Boston, Massachusetts* 02215 (F19628-75-C-0044)

AF function - advanced radar and satellite ranging-navigation systems. Deficiency - magnetic storms produce large departures from median ionospheric time delays in operational and planned systems. Research - develop and test models and theories of behavior of total electron content (TEC) - time delay during magnetic storms using actual TEC data from stations along the western Atlantic covering latitudes from polar to equatorial regions. How research contributes - improve navigation and satellite detection radar systems ranging accuracy by developing models and methods of improving predictions of time delay produced by the ionosphere during magnetic disturbances.

Supporting agency address information: AF Cambridge Research Laboratories LI, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0021, ATMOSPHERE DENSITY MEASUREMENT BY ROCKETBORNE ELECTRON BEAM TECHNIQUE
W. HUBER, Tri Con Associates Inc., *Cambridge, Massachusetts* (F19628-74-C-0023)

AF function - low altitude operational satellites and ballistic nuclear weapon delivery. Deficiency - trajectories of missiles and satellites cannot be precisely calculated. Research - development and testing of an accurate rocket density measuring device. How research contributes - a knowledge of the atmospheric density is necessary for the prediction of the behavior of upper atmosphere military vehicles, and the effect on the environment of nuclear weapon detonations. The objective of this work is to develop a rocketborne method of measuring atmospheric density using an electron beam. The technique will permit accurate density measurements between 100 and 200 km.

Supporting agency address information: AF Cambridge Research Laboratories LK, L. G. Hanscom Field, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0022, DAASM EXPERIMENT

K. BIBL, Lowell Technological Institute, Graduate School, *Lowell, Massachusetts* 01854 (F19628-73-C-0162)

AF function - over the horizon radar systems. Deficiency - lack of information on polar ionosphere irregularities causing fluctuations in scattered signals. Research - measure spectrum characteristics of forward and backscattered signals. How research contributes - the proper design of an over-the-horizon system operating in the polar environment requires spectrum and coherence data on clutter signals. The spectrum analyzing system provides on-line capability of examining the structure of the spectra and their changes as the ionosphere is probed using both a backscatter system at Goose Bay, Labrador, and signals from a flying kc 135 sounder. This project is directed specifically towards the high resolution study of the Doppler and arrival angle spectra of radio signals propagating long distances in the polar ionosphere.

Supporting agency address information: AF Cambridge Research Laboratories LI, L. G. Hanscom Field, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0023, EVALUATION OF USE OF SOLAR TO PROTON FLUX RATIOS TO PERDICT PARAMETERS OF SOLAR EVENTS

UNKNOWN, Panametrics Incorporated, *Waltham, Massachusetts* 02154 (F19628-73-C-0088)

AF function - communications and surveillance. Deficiency - inability to predict atmospheric and ionospheric conditions. Research - developing analytical techniques to determine parameters of interest. How research contributes - correlation between various solar particle flux parameters will be sought and these fluxes will be related to polar atmospheric and ionospheric phenomena. Particularly, it is desired that the relation between the alpha to proton flux ratio and other parameters of particle fluxes following a solar event be determined using data from satellite OV5-6. Also, the relationship of these fluxes to the degree and location of ionization in the polar atmosphere will be determined by calculation and compared with available data for selected events.

Supporting agency address information: AF Cambridge Research Laboratories PH, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0024, RADAR BACKSCATTER STUDIES OF THE IONOSPHERE

R.J. CICERONE, Univ. of Michigan, School of Engineering, *Ann Arbor, Michigan* 48106

This grant allows continuing support for a program of radar backscatter observations and related studies in Alaska.

The program has been successful in making progress on the definition of the Auroral environment and continuing good work is to be expected. These studies will include Dynamics of the Thermosphere, Ionosphere-Protonosphere Coupling, Thermosphere Hydrogen and Photoelectrons and Plasma Line Measurements as areas to be investigated.

SUPPORTED BY U.S. Natl. Science Foundation

5.0025, THE STRUCTURE OF PLANETARY ATMOSPHERES

T.M. DONAHUE, Univ. of Michigan, School of Arts, *Ann Arbor, Michigan* 48104

A broad line of research will be pursued in planetary atmosphere problems. These include application of an efficient computational technique for solving the coupled flow problem for photochemical species in planetary atmospheres to sort out the distribution of minor constituents in the stratosphere, mesosphere and thermosphere of the earth and other terrestrial planets. Thermal and nonthermal escape mechanisms for hydrogen in planetary atmospheres will be investigated. The implication of very dense particle layers over the sunlit terrestrial poles, observed from the OGO-6 satellite, will be investigated. Sodium nightglow data obtained on OGO-6 will be analyzed.

SUPPORTED BY U.S. Natl. Science Foundation

5.0026, TO ANALYZE WHISTLER DATA OBTAINED AT HALLEY BAY, ANTARCTICA, AND TO CONTINUE THE OBSERVATIONS

M.G. MORGAN, Dartmouth College, School of Engineering, *Hanover, New Hampshire* 03755

New VLF whistler data will be collected at Halley Bay, Antarctica, which is now equipped with newly designed apparatus, and analysis on previously collected data -- principally from 1971 and 1972 -- will continue. In comparison with data from other southern hemisphere stations, contour maps of the plasmapause and outer plasmaspheric electron density in the equatorial L shell-Local Magnetic Time (LMT) will be constructed. The constructions will be made as a function of universal time, latitude, and magnetic activity as well as LMT. The agreement of the location of the plasmapause, using the ground based VLF technique and the GSFC double floating probe technique will be studied to check the accuracy and compatibility of the two methods. The research on deduction of the plasmapause profiles from PC-1 micropulsation (ULF) whistlers) will continue. Since PC-1's propagate mainly beyond the plasmapause, consideration is being given to relocating the ULF equipment at Goose Bay, Newfoundland (L approximately 5). This will provide the best compromise overlap with the VLF data which propagates mainly inside the plasmapause i.e., 1. 4. Further studies will be made of whistler duct movement and associated east-west electric. The data from Halley Bay, Sanae and Siple will be compared in the investigation.

SUPPORTED BY U.S. Natl. Science Foundation

5.0027, NONLINEAR PROCESSES IN PLASMAS

R.M. KULSRUD, Princeton University, School of Engineering, *Princeton, New Jersey* 08540 (F44620-75-C-0037)

The basic nonlinear processes which occur in plasmas have applicability to x-ray emitting plasmas, the interaction between intense lasers and matter, and the structure of magnetospheric and ionospheric plasmas. These physical situations in turn impact upon Air Force requirements and capabilities relating to radiation sources for weapons effects simulation, high energy lasers, and system operations in a post nuclear environment. This research will investigate nonlinear collective effects of plasmas and will apply knowledge gained of the plasma state to the interpretation of dynamic phenomena in which collective effects play a role. Specific research topics will include - (1) the application of parametric instabilities to laser plasma heating, (2) the application to radio communication of the low-frequency turbulent spectra of magnetic field aligned striations, and (3) extending present nonlinear plasma theories into the strong turbulent regime with application to the saturation of strong instabilities occurring in EM beam and plasma interactions.

Supporting agency address information: AF Office of Scientific Research NPP, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0028, METEOROLOGY AND ATMOSPHERIC PHYSICS RESEARCH

J.E. MILLER, Polytechnic Inst. of New York, Graduate School, *Brooklyn, New York* 11201 (NSG 5041)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0029, ATMOSPHERIC MOTIONS FROM INCOHERENT SCATTER DATA ANALYSIS
D.T. FARLEY, Cornell University, School of Engineering, *Ithaca, New York* 14850

This grant will enable the investigators to use incoherent scatter observations to guide the construction of models of the mutual atmosphere and study dynamical effects of the ionosphere. Software will be developed with the aim of developing real-time data reduction techniques.

SUPPORTED BY U.S. Natl. Science Foundation

5.0030, SOIL INTERPRETATIONS AND SOCIO-ECONOMIC CRITERIA FOR LAND USE PLANNING
G.H. SIMONSON, Oregon State University, Agricultural Experiment Sta., *Corvallis, Oregon* 97331 (ORE00047 6R)

OBJECTIVE: Determination of physical and socio-economic causes and consequences of encroachment by urban activities upon rural lands. Identification and organization of the kinds of soil-behavior and soil- landscape data and interpretations needed by present and potential clientele. Evaluation of the adequacy of present basic and and interpretive data being offered for land use planning, and development of additonal, critically needed quantitative data, interpretations, and alternative procedures for overcoming soil limitations.

APPROACH: Conduct tests and laboratory analyses to characterize soil series. Compile information from various sources to develop soil use interpretations for communities, counties, and regional planning areas. Study integration of soil and other resource data; quantitative relationships between inherent soil properties and soil behavior or qualities; soil treatments to overcome use limitations; and soil landscape variability in relation to mapping unit definition and interpretive maps at different scales. Illustrate and promote use of soil interpretations in land use planning.

PROGRESS: A coordinated inventory of geology, landforms, soil- landscapes, timber volume, vegetation, and land use has been compiled for Crook County, utilizing 1:250,000 scale ERTS and 1:120,000 scale highflight color IR photography. Interpretations for land use are presented by Land Resource Units - areas with similar resources and land use and being evaluated for land use planning. Land use classes in the Willamette Valley have been mapped on high altitude color aerial photos. These classes are being related to soil distribution to assess resource use and influence of soil characteristics on land use patterns. Septic tank malfunctions in Lane County are being related to soil type to determine incidence of failures by soil parameters such as drainage, depth, texture and slope. Computer storage and retrieval of pedon data has been developed to aid analysis. A study of sandy soil characteristics influencing septic tank failures on the Oregon Coast has been initiated. Water table regimes are being monitored on approximately 30 sites of major series in S.W. Oregon. Soil characterization samples of 4 series in Josephine County and 2 from Hood River were collected.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0031, PAYLOAD SYSTEMS TO RELEASE CHEMICALS IN UPPER ATMOSPHERE AND STRATOSPHERE
UNKNOWN, Germantown Laboratories Inc., *Philadelphia, Pennsylvania* 19144 (F19628-75-C-0106)

AF function - detection, track, intercept, communication and operations. Deficiency - transmission of radio waves for communications and radar detection and tracking cannot be reliably predicted following nuclear detonation, or solar flares. Emission effects from aircraft operations at the 12-25 km altitude region of stratosphere are not thoroughly understood. Research - measurements of variation of plasma density profiles and transport processes by releasing appropriate chemicals. How research contributes - knowledge of atmospheric plasma density profiles will permit selection of radio frequencies for reliable communication and tracking. It will also contribute to knowledge of small scale turbulence and wind fields to understand the effect of exhaust emission at supersonic cruise altitudes. Abstract - chemicals are released from rockets as clouds, trails or explosions to provide markers for atmospheric motions and aircraft wake effects.

Supporting agency address information: AF Cambridge Research Laboratories LK, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0032, ATOMIC AND MOLECULAR PROCESSES IN ATMOSPHERIC ENVIRONMENTS 11427-P
M.A. BIONDI, Univ. of Pittsburgh, School of Arts, *Pittsburgh, Pennsylvania* 15213 (DAHC04-73-C-0037)

Studies of chemi-excitation in the upper atmosphere. Of direct bearing on both the optics and ivy-owl programs are determinations of chemi-excitation mechanisms which take place in the upper atmosphere.

A prime example of a naturally occurring, but poorly understood chemi-excitation process is the faint sodium nightlow. By using an optical interferometer to study the spectral line profile of the sodium nightglow radiation, one can obtain information concerning the reaction leading to the chemi-excitation as has been done using interferometric techniques in laboratory studies of the Na-N sub 2 chemiluminescence.

Supporting agency address information: AMC Army Research Office ARO-D, Durham, N.C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

5.0033, ATOMIC AND MOLECULAR PROCESSES IN ATMOSPHERIC ENVIRONMENTS 11427-P
E.C. ZIPF, Univ. of Pittsburgh, School of Arts, *Pittsburgh, Pennsylvania* 15213 (DAHC04-73-C-0037)

To study the processes involving metastable species. Dissociative excitation is an important upper atmosphere process under highly disturbed conditions. The very fast atoms produced in this manner (1) contribute efficiently to the heat economy of the upper atmosphere, (2) may lead to the production of large abundances of NO in auroral arcs by enhancing the role of 'hot atom' chemistry, (3) complicate trapped radiation problems because of the very broad emission lines that they emit, and (4) lead to the anomalous excitation of optical emission features.

Measurements of the velocity and angular distribution of the atoms produced by the dissociation of molecular targets by electron impact will be made. The experiments use time of flight and coincidence techniques and surface detectors to study metastable atoms produced by this mechanism. The apparatus will be modified so that studies can be made of the interaction of the kinetically 'hot' atoms produced by dissociative processes with atmospheric and debris gases. Both the radiation and chemical products resulting from these collisions will be studied in an attempt to define the role and ramifications of this mechanism in the disturbed atmosphere.

Supporting agency address information: AMC Army Research Office ARO-D, Durham, N.C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

5.0034, ATOMIC AND MOLECULAR PROCESSES IN ATMOSPHERIC ENVIRONMENTS 11427-P
E.C. ZIPF, Univ. of Pittsburgh, School of Arts, *Pittsburgh, Pennsylvania* 15213 (DAHC04-73-C-0037)

To study the radiative properties of atoms and simple molecules for optical discrimination and neutral composition measurements in the mesosphere. Dissociative excitation is important in the upper atmosphere under highly disturbed conditions (auroras, nuclear events, wakes, etc.). The direct-channel electron excitation measurements lay the foundation for an exceedingly sensitive optical technique for measuring the composition of the neutral atmosphere at altitudes that are awkward for conventional mass spectrometers, and measurements at altitudes as low as 50 km appear feasible. The initial two flights will concentrate specifically on a careful measurement of the 0, N. 0 sub 2 and N sub 2 concentrations.

Measurement of the absolute cross sections for exciting aeronomically important states of atomic oxygen, nitrogen, carbon, and hydrogen by electron impact will be made. Principal

emphasis will be placed on the direct electron impact excitation of atomic oxygen and nitrogen to states leading to the emission of photons in the extreme ultraviolet. Direct channel measurements establish the feasibility of an optical device for measuring the 0, 0 sub 2, N and N sub 2 densities in the D region and above. Two flight instruments embodying these ideas have been constructed and will be flown on board a Javelin rocket (high altitude experiment) and a Nike-Apache (mesospheric experiment).

Supporting agency address information: AMC Army Research Office ARO-D, Durham, N.C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

5.0035, EQUATORIAL RADIO PROPAGATION STUDIES
J. POMALAZA, Inst. Geofisico Del Peru, *Lima, Peru* (AF-AFOSR-1991-71)

AF function - communications, radar. Deficiency - signal fading, range and azimuth errors. Research - provides experimental data on ionospheric parameters at the equator. How research contributes - results directly applicable to fading and total electron content models. This work continues and extends observations of transmitting satellites from an observatory on the magnetic equator. The large antenna is being erected to provide adequate signal-to-noise ratios for very deep fading studies. Results are used by system designers.

Supporting agency address information: AF Cambridge Research Laboratories LI, L. G. Hanscom Field, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0036, USE OF ERTS DATA TO UPDATE AND MAP THE WETLANDS OF WESTERN TENNESSEE
J.B. REHDER, Univ. of Tennessee, School of Liberal Arts, *Knoxville, Tennessee* 37916 (NAS 8-31143)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0037, STUDY OF SELECTIVE INTERFERENCE MODULATION SPECTROMETER
D.J. BAKER, Utah State University, School of Engineering, *Logan, Utah* 84321 (F19628-74-C-0100)

AF function - surveillance, advanced detectors, meteorology. Deficiency - lack of knowledge of stratospheric emittance in the infrared region. Objective - to study the techniques and applications of a new type interference spectrometer. How research contributes - improvement of optical instrumentation for infrared atmospheric measurements. Approach - the work involves a study to demonstrate the possibilities of a new type interference spectrometer (S.I.M.S.) for the infrared. The approach will emphasize a comparison of the relative advantages and disadvantages of this new type instrument with other instruments for rocket, balloon and other field measurements in the infrared region.

Supporting agency address information: AF Cambridge Research Laboratories OP, L. G. Hanscom Field, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0038, MARINER VENUS MERCURY
N.J. TRASK, U.S. Dept. of the Interior, Geological Survey, *Herndon, Virginia* 22092

The project analyzes pictures of Mercury taken by the Mariner 10 spacecraft. The long range goal is to provide a set of geologic maps of the planet. The geologic history of Mercury is closely similar to that of the Moon. Craters, basins (circular structures up to 1300 km) and plains materials of various ages make up the surface. An ancient terrain, which appears to be older than much of the topography of the Moon is present and may give clues about the earliest history of the solar system.

SUPPORTED BY U.S. Dept. of Interior - Geological Survey

5.0039, NEWPORT OBSERVATORY
L. KERRY, U.S. Dept. of the Interior, Geological Survey, *Newport, Washington* 99156

States to which project pertains: Washington.

The GS operates and maintains a national and world-wide network of observing and reporting systems. Included are facilities and systems for describing, mapping and charting the earth, utilizing seismological and geomagnetic science and technology, and conducting related research and development. Newport observatory provides seismological data which are used to describe the occurrence of earthquakes and their effects on lives and property, and to monitor and record vibrations in the earth caused by earthquakes and large man-made disturbances. This information contributes to a better understanding of the earth's crust, mantle, and core; and of the nature of seismic hazards and risk. Magnetic data are used to update periodically regional and world magnetic charts, and to determine correction factors applicable to magnetic field measurements made by land, marine, and airborne magnetic survey parties. Additionally, this information supports studies in ionospheric physics, radio propagation phenomena, electrical conductivity, the composition of the core and mantle of the earth, and interplanetary space. Knowledge of magnetic declination and its secular change is required as input to the compilation of all sea and air navigation charts for use by marine and aircraft navigators and by public and private surveyors.

Plans are under consideration to telemeter selected channels of seismic data to the NEIS. Also, plans are under consideration to telemeter seismic data from the Tucson Observatory to Newport. When this plan is implemented, Newport will provide input to the Tsunami Warning Service from both Tucson and Newport.

SUPPORTED BY U.S. Dept. of Interior - Geological Survey

5.0040, DYNAMICS AND THERMODYNAMICS OF ARCTIC SEA ICE
M.D. COON, Univ. of Washington, Graduate School, *Seattle, Washington* 98105

The AIDJEX modeling effort is involved in (1) oceanic and atmospheric boundary layer studies; (2) the development of thermodynamic constitutive laws for arctic pack ice; and (3) the development of techniques for interpreting and processing pressure and position data from buoys, two dimensional data from remote sensing aircraft, and strain data from several sources. In their investigations, they are formulating new concepts and descriptions of physical processes as well as using previous research in new ways. This is a continuing project.

SUPPORTED BY U.S. Natl. Science Foundation

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, EVALUATION OF AN ANTIVERTIGINOUS DRUG IN MAN
J.R. BELJAN, Wright State University, Graduate School, *Dayton, Ohio* 45431 (NAS 2-8578)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0002, ELECTROKINETIC CHARACTERIZATION OF ALDEHYDE FIXED RED BLOOD CELLS, KIDNEY CELLS, LYMPHOCYTES AND CHAMBER WALL COATINGS
R.J. KNOX, Univ. of Oregon, Graduate School, *Eugene, Oregon* 97403 (NAS 8-80887)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

MATHEMATICAL AND COMPUTER SCIENCES

Includes Mathematical and Computer Sciences (general); Computer Operations and Hardware; Computer Programming and Software; Computer Systems; Cybernetics; Numerical Analysis; Statistics and Probability; Systems Analysis; and Theoretical Mathematics.

7.0001, SUPER-HIGH DATA COMPRESSION FOR THE TRANSMISSION OF DATA
D.B. COOPER, Brown University, Graduate School, *Providence, Rhode Island* 02912 (NSG 5036)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

PHYSICS

Includes Physics (general); Acoustics; Atomic and Molecular Physics; Nuclear and High-energy Physics; Optics; Plasma Physics; Solid-state Physics; Thermodynamics and Statistical Physics. For Related Information See Also Engineering.

8.0001, PLASMA PHYSICS OF SOLAR ENERGETIC PARTICLES
D.G. WENTZEL, Univ. of Maryland, School of Arts, *College Park, Maryland* 20740

Numerous plasma processes in the solar corona control the rate at which energetic electrons can escape to the solar atmosphere, causing X- ray bursts, or escape into the solar wind, to be observed near the Earth. Simple estimates show that whistler waves grow so rapidly in a region of magnetically trapped electrons and scatter the electrons so efficiently that the electrons can be trapped for at most a few seconds. This grant studies the relation of these waves to radio emissions from the sun.

SUPPORTED BY U.S. Natl. Science Foundation

SOCIAL SCIENCES

Includes Social Sciences (general); Administration and Management; Documentation and Information Science; Economics and Cost Analysis; Law and Political Science; and Urban Technology and Transportation.

9.0001, A PUBLIC LECTURE SERIES IN THE SCIENCES - 'EARTH 2020 - A VISION FOR OUR CHILDREN'S CHILDREN'
E.L. DUCKWORTH, U.S. Natl. Aero. & Space Adm., Ames Research Center, *Moffett Field, California* 94035

The NASA/Ames Research Center, in cooperation with private foundations, other government agencies, and local universities, will coordinate and conduct a public science education lecture series in six western cities: San Francisco, San Jose, Los Angeles, and San Diego, CA; Portland, Ore.; and Honolulu, HA. This series will involve eleven lectures in each city on the general theme of the design of the natural world and the effect of man upon nature and suggest possible constructive solutions for present anticipated problems. This series follows upon the successful pattern of two previous lecture series on cosmic evolution and the future which attracted nearly 200,000 people in California alone.

Speakers in the current lecture series include Garrett Hardin, Harrison Brown, John Pierce, Kenneth Boulding, and Richard Gardner. Each speaker will deliver his lecture seven times on the lecture circuit and will give three seminars to teachers at faculty institutes. Numerous press interviews will also be scheduled. Based on the lectures, a compact volume of curricula, teaching suggestions, and reference lists for written and audiovisual materials will be produced for school use and an illustrated volume of abstracts of all lectures prepared for public dissemination.

Total program costs for the series and ancillary programs is approximately $700,000. NSF funds will be used to support speaker honoraria and travel costs and to cover auditorium and related costs in Portland and Honolulu.

SUPPORTED BY U.S. Natl. Science Foundation

9.0002, PROJECT MAILNET
C.J. WITZGALL, U.S. Dept. of Commerce, Natl. Bureau of Standards, *Washington, District of Columbia* 20234 (2050481(NBS NO.))

U.S. Postal Services is considering a satellite-based Electronic Mail System. We will assist in the evaluation, development, testing and use of supporting mathematical analysis/synthesis methods. Present emphasis is on deciding which cities should comprise the initial network ('deployment and marketing studies').

Objective. To provide sound efficient mathematical methods for use in the U.S. Postal Service's studies of a satellite-based Electronic Mail System (EMS). Initial emphasis is on which cities should be the early sites of the Electronic Mail Facilities (EMF's) making up the system.

Motivation. The substantial investment required for such a system dictates that the cities to be served are selected with the aid of a quantitative rationale balancing benefits and costs.

Approach. Mathematical methods reviewed in phase I (FY 1974) involved techniques of linear and nonlinear programming, graph theory, and approximation theory. The preferred alternative will be implemented and tested on USPS-supplied data and jointly-formulated scenarios.

Progress (FY 74). A variety of mathematical approaches, some previously proposed and some new, were formulated and evaluated as to cost, flexibility and over-all promise. Two (an 'incremental' method and a 'dual network' method) were recommended for further development.

SUPPORTED BY U.S. Postal Service

9.0003, COOPERATIVE EFFORT IN CONDUCT OF MARTIN MARIETTA CORP - DEMONSTRATION GRANT (EPA NO. S 801790)
W.L. SMITH, U.S. Natl. Aero. & Space Adm., Headquarters, *Washington, District of Columbia* 20546 (72P21167)

The agreement formalizes the cooperation between NAS and EPA on this Demonstration Grant (No. S801790), contracted with the Martin Marietta Corporation. EPA shall provide for the overall management of the grant, making sure that the standards of both agencies are adhered to.

SUPPORTED BY U.S. Environ. Protect. Agency - O.R.M.

9.0004, COMMUNITY DEVELOPMENT PROGRAM EFFECTS ON LAND USE
J.C. CALLAHAN, Purdue University, Agricultural Experiment Sta., *Lafayette, Indiana* 47907 (IND01748)

OBJECTIVE: Determine the social and economic benefits and costs including land use and transportation impacts associated with the extension of water systems into rural areas.

APPROACH: The problem will be approached by studying areas of the Crawford and Norman Uplands in southern Indiana where rural water systems have been completed. Bloomington and Columbus are growing urbanized areas which directly affect the use of rural land and public forests. Economic models will be used to explain changes in land use, economic opportunity and population movements. Use of the models as a research instrument will attempt to predict later changes and consequences if water systems are extended into other rural areas.

PROGRESS: A working document was prepared on the general geomorphology, vegetative regimes, and human resources of the unglaciated area of southern Indiana. The geographic scope for further phases of the study was restricted to Indiana Planning and Development Region 10 (Dubois, Crawford, and Orange counties) in order to get desired depth of analysis in an identifiable region which provides all the resource and human related factors found in this unglaciated portion of the state including the development of rural water systems and the construction of a major impoundment (Patoka Lake--8,800 surface acres of water). Bench mark studies involving land ownership and land use were commenced. The land use study was enhanced through the use of NASA-LARS imagery taken in 1971 using a Veriscan machine to obtain the optical remote sensing information. Base maps were prepared for Region 10 utilizing some of this data in conjunction with USGS topographic information and soils survey data. A data bank of economic and social information was also started utilizing conventional secondary sources, Corps of Engineers data, and information obtained through interviews with public officials and private citizens in the region. An aspect of public policy with relation to the region's forest resources was completed as well as a summary of economic and physical input/output data with respect to regional forestry production functions.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, COMPARATIVE PLANETARY GEOLOGY

E.C. MORRIS, U.S. Dept. of the Interior, Geological Survey, *Flagstaff, Arizona* 86001

The overall objective of this project is to study and photographically document terrestrial geologic features of the type now recognized on Mars to improve the geologic interpretability of the MM '71, Venus-Mercury, and Viking '75 Orbiter and Lander data. These studies will include features that originate by aeolian, fluvial, glacial, volcanic, tectonic processes and by mass movement under the influence of gravity.

Orbital and high altitude conventional terrestrial photography with resolutions similar to those for Mariner 9 will be systematically scanned for comparison with features seen in the MM '71 pictures. In selected areas these features will be delineated by distribution pattern and topographic form and their relationship to the general geologic environment determined. Selected studies, including both ground and aerial reconnaissance, will be made of areas chosen from the high altitude and orbital photographic studies, or on the basis of a prior information.

For FY '76 three major tasks will be undertaken under the general heading for Geologic Support for Planetary Missions: 1) Comparative Planetary Geology; 2) Instrument Research and Development; 3) Experimental.

SUPPORTED BY U.S. Dept. of Interior - Geological Survey

10.0002, TEMPERATURE STRUCTURE OF THE SOLAR CORONA

J.M. BECKERS, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts*

Objective - AF function - communication, surveillance, detection, tracking. Deficiency - inadequate warnings of sun induced disruptions. How research contributes - provides the physical knowledge necessary for a sound cause and effect flare prediction technique. The specific objective is to measure the temperature distribution in the solar corona and in the corona/solar wind interface.

Specifically, during the June 20, 1974 solar eclipse, the profile of the coronal lyman alpha line will be measured. This profile will result in the first direct measurement of the coronal proton temperatures over a very large height range in the solar corona. Knowledge of the coronal temperature profile is essential for the understanding of the interaction of the sun with the interplanetary and the earth's environment. The accurate measurement of the temperature as a function of height of the solar atmosphere is critical to understanding the mass and energy processes occurring in the upper solar atmosphere. A solar eclipse offers a unique opportunity to obtain temperature measurements in the regions of the solar atmosphere where the coronal heating occurs and where the solar wind originates.

Supporting agency address information: AF Cambridge Research Laboratories LM, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

10.0003, COMPARISON OF LYMAN 2 AND HE 1 & 10830 LINE STRUCTURES AND VARIATIONS IN EARLY TYPE STAR ATMOSPHERE

D.D. MEISEL, State University of New York, Graduate School, *Geneseo, New York* 14454 (NGR 33-219-002)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0004, DATING OF LUNAR CRATERING EVENTS AND RATES OF LUNAR SURFACE PROCESSES

J.B. HARTUNG, State University of New York, Graduate School, *Stony Brook, New York* 11790 (NSG 9013)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0005, PALEOHYDROLOGY OF MARS

M.O. HAYES, Univ. of South Carolina, Graduate School, *Columbia, South Carolina* 29208 (NSG 7076)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

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01 AERONAUTICS (GENERAL)

N75-19126*# Massachusetts Inst. of Tech., Cambridge.
PROCEEDINGS OF THE 9TH ANNUAL CONFERENCE ON MANUAL CONTROL
1973 414 p refs Conf. held at Cambridge, Mass., 23-25 May 1973 Sponsored by NASA and DOT
(NASA-CR-142295) Avail: NTIS HC $10.50 CSCL 01C

Papers are reported which were presented at the conference in the areas of displays, ride qualities and handling, driving and psychomotor skills, control, system identification and signal detection, electrophysiological and systems analysis, and modelling. For individual titles, see N75-19127 through N75-19164.

N75-19127* Michigan Univ., Ann Arbor. Dept. of Aerospace Engineering.
EFFECTS OF VISUAL FLIGHT DISPLAY DYNAMICS ON ALTITUDE TRACKING PERFORMANCE IN A FLIGHT SIMULATOR **c53**
E. F. Weener, R. M. Howe, and R. W. Pew *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 3-8 (For availability see N75-19126 11-01)
CSCL 05E

The effects were studied of visual display dynamics on pilot tracking performance in a simulator. The tracking task consisted of maintaining the piloted aircraft at the same altitude as two aircraft positioned three-hundred feet ahead; as would be required in level formation flying. The two leading aircraft were represented symbolically along with the horizon on a CRT display. Vertical position of these aircraft with respect to the horizon indicated the altitude of the subject's aircraft. which was disturbed by atmospheric turbulence. Various bandwidths of second-order dynamics were interposed between the true aircraft altitude and the displayed altitude, whereas no dynamics were interposed in the attitude display. Experiments were run using two experienced pilots and two substantually different longitudinal dynamics for the piloted aircraft. Preliminary results indicate a significant decrease in altitude tracking performance for display dynamics with natural frequencies below ten radians per second. Author

N75-19128* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A STUDY ON AIRCRAFT MAP DISPLAY LOCATION AND ORIENTATION **c06**
D. L. Baty, T. E. Wempe, and E. M. Huff *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 9-24 refs (For availability see N75-19126 11-01)
CSCL 01D

Six airline pilots participated in a fixed-base simulator study to determine the effects of two Horizontal Situation Display (HSD/map) panel locations relative to the Vertical Situation Display (VSD), and of three map orientations on manual piloting performance. Pilot comments and opinions were formally obtained. Significant performance differences were found between wind conditions, and among pilots, but not between map locations and orientations. The results also illustrate the potential tracking accuracy of such a display. Recommendations concerning display location and map orientation are made. Author

N75-19129* Massachusetts Inst. of Tech., Cambridge. Man-Vehicle Lab.
THE EFFECT OF COMMUNICATIONS AND TRAFFIC SITUATION DISPLAYS ON PILOTS AWARENESS OF TRAFFIC IN THE TERMINAL AREA **c53**
D. Melanson, R. E. Curry, J. D. Howell, and M. E. Connelly *In its* Proc. of the 9th Ann. Conf. on Manual Control 1973 p 25-39 refs (For availability see N75-19126 11-01)
CSCL 05E

The Air Traffic Control (ATC) system is evolving under a general plan specified by the Federal Aviation Administration. Among the developments being considered is the Discrete Address Beacon System (DABS). The use of this system, although relieving congestion on the communications frequencies, would eliminate information about other aircraft because the party line communications now in use would be lost. One alternative to restore this lost information is an Airborne Traffic Situation Display (TSD). Experienced airline and military pilots participated in a factorial design to evaluate two types of communication (discrete address, party line) and two types of displays (TSD, no TSD). A stop-action quiz was used to evaluate their knowledge of other aircrafts' position, altitude, speed, heading, rate of climb, identity, and landing sequence number. Significant differences between conditions were detected, primarily in the position variables. Workload, as measured by a spare capacity side-task, showed a main effect of displays and a significant interaction between displays and communications. The data are summarized by plotting each display/communication condition configuration in the plane defined by information and workload index. A limited number of blunders by other aircraft were included in the simulations with a significant, but not entirely satisfactory, improvement in blunder detection attributed to the TSD. Author

N75-19130* Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).
DYNAMIC READING OF ANALOG AND DIGITAL DISPLAYS: A COMPARATIVE STUDY **c08**
E. Schubert *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 43-48 refs (For availability see N75-19126 11-01)
CSCL 01C

Several display formats were studied. Analog, digital, and some hybrid (analog-digital) formats were considered. It was found that the hybrid displays are superior to digital or analog displays. F.O.S.

N75-19131* Ohio State Univ., Columbus. Dept. of Aviation.
A TACTUAL PILOT AID FOR THE APPROACH-AND-LANDING TASK: INFLIGHT STUDIES **c08**
Richard D. Gilson and Robert E. Fenton *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 49-53 refs (For availability see N75-19126 11-01)
CSCL 01C

A pilot aid -- a kinesthetic-tactual compensatory display --

for assisting novice pilots in various inflight situations has undergone preliminary inflight testing. The efficacy of this display, as compared with two types of visual displays, was evaluated in both a highly structured approach-and-landing task and a less structured test involving tight turns about a point. In both situations, the displayed quantity was the deviation (alpha sub 0 - alpha) in angle at attack from a desired value alpha sub 0. In the former, the performance with the tactual display was comparable with that obtained using a visual display of (alpha sub 0 - alpha), while in the later, substantial improvements (reduced tracking error (55%), decreased maximum altitude variations (67%), and decreased speed variations (43%)), were obtained using the tactual display. It appears that such a display offers considerable potential for inflight use. Author

N75-19132* Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
EVALUATION OF TACTUAL DISPLAYS FOR FLIGHT CONTROL c08
William H. Levison, Robert B. Tanner, and Thomas J. Triggs *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 55-71 refs Sponsored in part by ARPA (For availability see N75-19126 11-01)
(Contract N00014-73-C-0031)
CSCL 01C

Manual tracking experiments were conducted to determine the suitability of tactual displays for presenting flight-control information in multitask situations. Although tracking error scores are considerably greater than scores obtained with a continuous visual display, preliminary results indicate that inter-task interference effects are substantially less with the tactual display in situations that impose high visual scanning workloads. The single-task performance degradation found with the tactual display appears to be a result of the coding scheme rather than the use of the tactual sensory mode per se. Analysis with the state-variable pilot/vehicle model shows that reliable predictions of tracking errors can be obtained for wide-band tracking systems once the pilot-related model parameters have been adjusted to reflect the pilot-display interaction. Author

N75-19133* Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
PITCH PAPER PILOT REVISITED c08
John D. Arnold, Robert B. Johnson, and James D. Dillow *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 75-81 refs (For availability see N75-19126 11-01)
CSCL 01C

Two methods are described for predicting the handling qualities of an aircraft in pitch. Both methods are based on minimizing a pilot rating expression with respect to free pilot parameters. In one case the pilot rating expression was developed from a set of moving base simulation data. In the other case, the pilot rating expression was developed from a set of fixed base simulation data. In both cases pilot rating is primarily a function of pitch attitude and pitch rate; however, in the moving base case, the pilot rating is more sensitive to pitch rate than in the fixed base case. For each method, predicted pilot ratings and performance measures agree well with the measured data corresponding to that case. Both methods are used to predict pilot ratings for a set of flight test configurations and the results of the two methods agree to within one half a rating unit. The predicted ratings in both cases correlate well with the actual pilot ratings from the flight tests. Author

N75-19134* Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
ROLL PAPER PILOT c08
Flynoy R. Naylor, James D. Dillow, and Russell A. Hannen *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 83-92 refs (For availability see N75-19126 11-01)
CSCL 01C

A mathematical model for predicting the pilot rating of an aircraft in a roll task is described. The model includes: (1) the lateral-directional aircraft equations of motion; (2) a stochastic gust model; (3) a pilot model with two free parameters; and (4) a pilot rating expression that is a function of rms roll angle and the pilot lead time constant. The pilot gain and lead time constant are selected to minimize the pilot rating expression. The pilot parameters are then adjusted to provide a 20% stability margin and the adjusted pilot parameters are used to compute a roll paper pilot rating of the aircraft/gust configuration. The roll paper pilot rating was computed for 25 aircraft/gust configurations. A range of actual ratings from 2 to 9 were encountered and the roll paper pilot ratings agree quite well with the actual ratings. In addition there is good correlation between predicted and measured rms roll angle. Author

N75-19135* Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
PAPER PILOT PONDERS SUPERSONIC TRANSPORTS c08
John R. Stone *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 95-101 refs (For availability see N75-19126 11-01)
CSCL 01C

The application is described of the digital program Pitch Paper Pilot to a presimulation analysis of a large delta wing aircraft similar to the Concorde supersonic transport. Pilot acceptance (in terms of Cooper-Harper ratings), pilot model parameters, and pilot-vehicle performance were predicted by Paper Pilot and compared to actual inflight measures. Results are good and illustrate the value of using the Paper Pilot concept during the planning stages of simulation. Author

N75-19136* Systems Technology, Inc., Hawthorne, Calif.
HANDLING PROPERTIES OF DIVERSE AUTOMOBILES AND CORRELATION WITH FULL SCALE RESPONSE DATA c53
Roger H. Hoh and David H. Weir *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 103-118 refs (For availability see N75-19126 11-01)
(Contract DOT-FH-11-7570)
CSCL 05E

Driver/vehicle response and performance of a variety of vehicles in the presence of aerodynamic disturbances are discussed. Steering control is emphasized. The vehicles include full size station wagon, sedan, compact sedan, van, pickup truck/camper, and wagon towing trailer. Driver/vehicle analyses are used to estimate response and performance. These estimates are correlated with full scale data with test drivers and the results are used to refine the driver/vehicle models, control structure, and loop closure criteria. The analyses and data indicate that the driver adjusts his steering control properties (when he can) to achieve roughly the same level of performance despite vehicle variations. For the more disturbance susceptible vehicles, such as the van, the driver tightens up his control. Other vehicles have handling dynamics which cause him to loosen his control response, even though performance degrades. Author

N75-19137* Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
A DISPLAY EVALUATION METHODOLOGY APPLIED TO VERTICAL SITUATION DISPLAYS c06
Sheldon Baron and William H. Levison *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 121-132 refs (For availability see N75-19126 11-01)
(Contract NAS2-6652)
CSCL 01D

An approach to display evaluation based on the optimal-control or state-variable model of the human operator is described. The approach evolved over the past several years, and is believed to have significant advantages for display evaluation. The foundations of the methodology are briefly described, and results are presented of its application to the analysis of vertical situation displays for STOL approach. This analysis includes the effects of both status and command displays on pilot workload and system performance. Author

N75-19138* McDonnell-Douglas Corp., Long Beach, Calif.
A CONFORMAL HEAD-UP DISPLAY FOR THE VISUAL APPROACH c06
J. M. Naish *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 133-145 refs (For availability see N75-19126 11-01)
CSCL 01D

The degree of conformity used in matching a superimposed display to its visual background is considered in relation to the information available for vertical guidance and control during a

purely visual approach. The information may be represented by individual symbols or combined in a single symbol, and the relative merits of these methods are discussed. A fully conformal display format is developed for the purpose of showing both the position and direction of the flight path, with provision for the effects of disturbances, ILS compatibility, and control needs. The field of view needed for all conditions and phases of the visual approach with a fully conformal display is studied in relation to the limitations of conventional collimator systems. Methods are discussed which depend on deviation of the sight line, and on windshield reflection of the uncollimated image of a simple pointer. Limited flight tests show some promise for the uncollimated method. Author

N75-19139* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

PILOT PERFORMANCE DURING A SIMULATED STANDARD INSTRUMENT PROCEDURE TURN WITH AND WITHOUT A PREDICTOR DISPLAY c53

John G. Kreifeldt (Tufts Univ.) and Thomas Wempe *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 147-162 refs (For availability see N75-19126 11-01)

CSCL 05E

A simulator study was conducted to measure the effectiveness of predictor information incorporated into a CRT display of a computer simulated aircraft's horizontal and vertical situation. Professional pilots served as subjects for the task of executing a standard instrument procedure turn at constant altitude in constant crosswinds with and without their predicted ground track displayed. The results show that the display with the predicted ground track was markedly and significantly superior to the display without this information and that the subjects were generally satisfied with this type of information. Mean rms lateral path error was independent of the crosswind velocity with the predictor information, and increased without it with increasing wind velocity. Rms stick activity decreased with the predictor display which also uncoupled aileron and elevator activity. Author

N75-19140* Bolt, Beranek, and Newman, Inc., Cambridge, Mass.

A MODEL BASED TECHNIQUE FOR THE DESIGN OF FLIGHT DIRECTORS

William H. Levison *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 163-172 refs (For availability see N75-19126 11-01)

(Contract NAS2-6652)

CSCL 01C

A new technique for designing flight directors is discussed. This technique uses the optimal-control pilot/vehicle model to determine the appropriate control strategy. The dynamics of this control strategy are then incorporated into the director control laws, thereby enabling the pilot to operate at a significantly lower workload. A preliminary design of a control director for maintaining a STOL vehicle on the approach path in the presence of random air turbulence is evaluated. By selecting model parameters in terms of allowable path deviations and pilot workload levels, a set of director laws is achieved which allows improved system performance at reduced workload levels. The pilot acts essentially as a proportional controller with regard to the director signals, and control motions are compatible with those appropriate to status-only displays. Author

N75-19141* Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).

IMPROVEMENTS IN PILOT/AIRCRAFT-INTEGRATION BY ADVANCED CONTACT ANALOG DISPLAYS c06

V. Wilckens *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 175-192 refs (For availability see N75-19126 11-01)

CSCL 01D

Several expert statements selected from literature and concerning the qualities of modern information displays lead to the definition of a number of requirements which should be covered by the displays of the future. It is shown that abstract displays principally cannot fulfill all these demands and that simply superimposing abstract symbols with the natural view of the outside world or with it's artificial equivalent will not result in an optimum solution. Some test results are shown for confirmation of the concept; special and general problems are touched. Author

N75-19142* Massachusetts Inst. of Tech., Cambridge. Man-Vehicle Lab.

VISUALLY INDUCED SENSATIONS OF MOTION c53

L. R. Young, J. M. Dichgans, and C. M. Oman *In its* Proc. of the 9th Ann. Conf. on Manual Control 1973 p 193-195 refs (For availability see N75-19126 11-01)

CSCL 05E

Modeling the visual and vestibular information integration process in humans was studied to determine the implications of these models with respect to requirements for flight simulation. The interaction between visual circularvection and vestibular responses is discussed. F.O.S.

N75-19143* General Motors Corp., Detroit, Mich.

SENSITIVITY OF A CRITICAL TRACKING TASK TO ALCOHOL IMPAIRMENT c53

Jean A. Tennant and Richard R. Thompson *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 201-213 refs (For availability see N75-19126 11-01)

CSCL 05E

A first order critical tracking task is evaluated for its potential to discriminate between sober and intoxicated performances. Mean differences between predrink and postdrink performances as a function of BAC are analyzed. Quantification of the results shows that intoxicated failure rates of 50% for blood alcohol concentrations (BACs) at or above 0.1%, and 75% for BACs at or above 0.14%, can be attained with no sober failure rates. A high initial rate of learning is observed, perhaps due to the very nature of the task whereby the operator is always pushed to his limit, and the scores approach a stable asymptote after approximately 50 trials. Finally, the implementation of the task as an ignition interlock system in the automobile environment is discussed. It is pointed out that lower critical performance limits are anticipated for the mechanized automotive units because of the introduction of larger hardware and neuromuscular lags. Whether such degradation in performance would reduce the effectiveness of the device or not will be determined in a continuing program involving a broader based sample of the driving population and performance correlations with both BACs and driving proficiency. Author

N75-19144* Systems Technology, Inc., Hawthorne, Calif.

MEASUREMENT OF DRIVER/VEHICLE MULTILOOP RESPONSE PROPERTIES WITH A SINGLE DISTURBANCE INPUT c53

Duane T. McRuer, David H. Weir, Henry R. Jex, Raymond E. Magdaleno, and R. Wade Allen *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 217-232 refs (For availability see N75-19126 11-01)

CSCL 05E

Multiloop response properties of controllers are, in general, very difficult to obtain because an independent forcing function is needed for each describing function to be measured, and interpolation procedures may be required to obtain intermediate describing functions at common frequencies. Two examples are provided for the measurement of driver/vehicle multiloop response properties using a single disturbance input. The validity of the procedure is based on current multiloop operator adjustment rules and is made plausible by comparison with experimental data. Author

N75-19145* Michigan Univ., Ann Arbor. Highway Safety Research Inst.

AN EXPERIMENTAL STUDY OF THE MOTORCYCLE ROLL STABILIZATION TASK c54

David J. Eaton *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 233-243 refs (For availability see N75-19126 11-01)

CSCL 05H

The work of Sharp represents the most complete theoretical analysis of the uncontrolled motorcycle presently available, and serves as a theoretical basis for the study described. Sharp's analysis included roll, yaw, lateral translation, and steering degrees of freedom, and the resulting equations are linear with constant coefficients. Tire aligning moments due to tire sideslip were

added to Sharp's equations. Experimental results are presented, and related to the theoretical studies of Sharp and Weir. Author

N75-19146* Systems Technology, Inc., Hawthorne, Calif.
COMPARISONS OF POPULATION SUBGROUPS PERFORMANCE ON A KEYBOARD PSYCHOMOTOR TASK c53
Robert L. Stapleford *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 245-255 (For availability see N75-19126 11-01)
CSCL 05E

Response time and pass/fail data were obtained from 163 subjects performing a psychomotor task. The basic task comprised a random five digit number briefly displayed to the subject at the start of each trail, and the keyboard on which the subject was to enter the number as fast as he could accurately do so after the display was extinguished. Some tests were run with the addition of a secondary task which required the subject to respond to a displayed light appearing at a random time. Matched pairs of subjects were selected from the group to analyze the effects of age, sex, intelligence, prior keyboard skill, and drinking habits. There was little or no effect due to age or drinking habits. Differences in response time were: average IQ subjects faster than low IQ subjects by 0.5 to 0.6 sec; subjects with prior keyboard skill faster by 0.4 to 0.5 sec; and female subjects faster by 0.2 to 0.3 sec. These effects were generally insensitive to the presence of the secondary task. Author

N75-19147* Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).
OPTIMIZATION OF CONTROL GAIN BY OPERATOR ADJUSTMENT c08
W. Kruse and G. Rothbauer *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 259-263 refs (For availability see N75-19126 11-01)
CSCL 05H

An optimal gain was established by measuring errors at 5 discrete control gain settings in an experimental set-up consisting of a 2-dimensional, first-order pursuit tracking task performed by subjects (S's). No significant experience effect on optimum gain setting was found in the first experiment. During the second experiment, in which control gain was continuously adjustable, high experienced S's tended to reach the previously determined optimum gain quite accurately and quickly. Less experienced S's tended to select a marginally optimum gain either below or above the experimentally determined optimum depending on initial control gain setting, although mean settings of both groups were equal. This quick and simple method is recommended for selecting control gains for different control systems and forcing functions. Author

N75-19148* Wright State Univ., Dayton, Ohio.
THE EFFECTS OF DISPLAY VARIABLES AND SECONDARY LOADING ON THE DUAL AXIS CRITICAL TASK PERFORMANCE c53
George M. Swisher and S. Nataraj (Sinclair Community Coll., Dayton, Ohio) *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 265-278 refs (For availability see N75-19126 11-01)
CSCL 05E

The effects of scanning displays for separated instruments, separated versus combined displays, and the effects of secondary loading are investigated. An operator rating scale for handling qualities is established analogous to the Cooper Harper Scale. Author

N75-19149* Technische Hogeschool, Delft (Netherlands). Man-Machine Systems Group.
PARAMETER ESTIMATION IN LINEAR MODELS OF THE HUMAN OPERATOR IN A CLOSED LOOP WITH APPLICATION OF DETERMINISTIC TEST SIGNALS c53
A. VanLunteren and H. G. Stassen *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 289-297 refs (For availability see N75-19126 11-01)
CSCL 05E

Parameter estimation techniques are discussed with emphasis on unbiased estimates in the presence of noise. A distinction between open and closed loop systems is made. A method is given based on the application of external forcing functions consisting of a sun of sinusoids; this method is thus based on the estimation of Fourier coefficients and is applicable for models with poles and zeros in open and closed loop systems. Author

N75-19150* Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
IDENTIFICATION OF HUMAN OPERATOR PERFORMANCE MODELS UTILIZING TIME SERIES ANALYSIS c53
Frank M. Holden and Stanley M. Shinners (Sperry Rand Corp., Great Neck, N. Y.) *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 301-309 refs (For availability see N75-19126 11-01)
CSCL 05E

The results of an effort performed by Sperry Systems Management Division for AMRL in applying time series analysis as a tool for modeling the human operator are presented. This technique is utilized for determining the variation of the human transfer function under various levels of stress. The human operator's model is determined based on actual input and output data from a tracking experiment. Author

N75-19151* National Aerospace Lab., Amsterdam (Netherlands).
IN-FLIGHT MEASURED HUMAN PILOT DESCRIBING FUNCTION AND REMNANT FOR PITCH ATTITUDE CONTROL c53
H. A. Mooij *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 311-317 refs (For availability see N75-19126 11-01)
CSCL 05H

Flight tests have been performed with a variable pitch-rate-command/attitude-hold flight control system in a Beechoraft Queen air-80 aircraft. Some results of in-flight measured runs for two pilots controlling typical easy and difficult dynamics are presented together with the initial results of the same tracking experiment performed on a ground-based flight simulator. Results are compared with results of other investigators using fixed-base flight simulators. Author

N75-19152* Calspan Corp., Buffalo, N.Y.
A SIMPLIFIED SIGNAL ANALYSIS TECHNIQUE FOR OBTAINING OPTIMAL ESTIMATES OF SYSTEM DYNAMICS c66
R. F. Whitbeck *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 319-323 refs (For availability see N75-19126 11-01)
CSCL 12B

A procedure is presented which provides an algorithm for the special case where the unknown system has n inputs, and n finite length realizations for each of the n input signals are available. Given an n input system and n experimental records for each input, it is shown that the optimum Wiener filter is easily computed using only the experimental data. No assumptions concerning the analytical structure of the spectral matrix are necessary. Author

N75-19153* Illinois Univ., Chicago. Coll. of Engineering.
A STOCHASTIC MODEL OF THE ELECTROMYOGRAM c52
Gyan C. Agarwal and Gerald L. Gottlieb *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 327-333 refs Sponsored in part by NSF (For availability see N75-19126 11-01)
CSCL 06E

The quantitative regularities of interference pattern formation by motor unit action potentials is investigated. The parameters of a single motor unit and how they relate to the Fourier transform analysis of an EMG are conisdered. The Fourier transform of the simulated electromyogram is compared with the Fourier transform of the actual EMG recorded from various human muscles using surface electrodes. Author

N75-19154* Systems Technology, Inc., Hawthorne, Calif.
MODELING AND MEASURING LIMB FINE-MOTOR UNSTEADINESS c53
Raymond E. Magdaleno, Henry R. Jex, and R. Wade Allen *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 335-349 refs (For availability see N75-19126 11-01)
CSCL 05E

Fine-motor unsteadiness its properties, conceptual and

analytical models, and experimental measurements is examined. Based on a data review, the tentative model derived includes: neuromuscular system, grip interface, and control system dynamic elements. The properties of this model change with muscle tension and match a wide group of extant data. A simple experiment was performed to investigate the amplitude/force relationships of the tremor mode. As the finger-pull force increased from 5 to 20 Newtons, the tremor mode frequency for a given individual stayed within roughly + or - 1 Hz over a range from 9-12 Hz, while the average magnitude of the rms tremor acceleration increased tenfold. A standardized test for making such measurements is given and applications in the fields of psychophysiological stress and strain measurements are mentioned. Author

N75-19155* Medical Coll. of Ohio, Toledo. Dept. of Neurosciences.
THE MUSCLE SPINDLE AS A FEEDBACK ELEMENT IN MUSCLE CONTROL c52
Lee T. Andrews, Anthony M. Iannone, and Donald J. Ewing (Toledo Univ., Ohio) *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 353-363 refs (For availability see N75-19126 11-01)
CSCL 06P

The muscle spindle, the feedback element in the myotatic (stretch) reflex, is a major contributor to muscular control. Therefore, an accurate description of behavior of the muscle spindle during active contraction of the muscle, as well as during passive stretch, is essential to the understanding of muscle control. Animal experiments were performed in order to obtain the data necessary to model the muscle spindle. Spectral density functions were used to identify a linear approximation of the two types of nerve endings from the spindle. A model reference adaptive control system was used on a hybrid computer to optimize the anatomically defined lumped parameter estimate of the spindle. The derived nonlinear model accurately predicts the behavior of the muscle spindle both during active discharge and during its silent period. This model is used to determine the mechanism employed to control muscle movement. Author

N75-19156* Massachusetts Inst. of Tech., Cambridge.
CONTINUOUSLY VARYING SKIN POTENTIALS ELICITED BY SINUSOIDALLY VARYING ELECTRIC SHOCK POTENTIALS c52
J. W. Senders, V. L. Senders, and B. Tursky *In its* Proc. of the 9th Ann. Conf. on Manual Control 1973 p 365-365b (For availability see N75-19126 11-01)
CSCL 06E

An investigation was carried out to determine whether a form of quasi-linear systems analysis can be applied to electrodermal responses to yield new insights into the nature of the response mechanisms and their interrelationships. The response investigated was the electrodermal response (galvanic skin potential, GSP) as elicited by an electric shock stimulus applied to the skin. The response subsequent to this stimulation was examined and its characteristics measured. A series of experimental runs on three Ss was accomplished, using sinusoidal modulation envelopes of frequencies. Results showed that it was possible to drive the GSP and to achieve relatively high coherence between the driving frequency and the response itself. The analysis was limited to Fourier analysis of the response in order to determine the relative energies at the driving frequency and at successive harmonics of that driving frequency, and correlational analysis in order to determine the degree of linear relationship between the driving frequency and the driven response. Author

N75-19157* Technische Hogeschool, Delft (Netherlands).
MODELING THE BEHAVIOR OF THE HELMSMAN STEERING A SHIP c53
W. Veldhuyzen and H. G. Stassen *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 367-377 refs (For availability see N75-19126 11-01)
CSCL 05E

A supertanker is considered as a nonlinear system which responds very slowly to changes in the rudder position. Moreover this type of ship is often unstable in loaded condition. In order to model the helmsman's behavior, a number of tests were performed using a ship maneuvering simulator. The trained subjects had to steer a 200,000 tons tanker along a varying course. The results obtained from these trials are presented. Author

N75-19158* Systems Technology, Inc., Princeton, N.J.
FURTHER EXAMINATION OF PILOT INSTRUMENT SCANNING DATA AND DEVELOPMENT OF A NEW LINK VALUE ESTIMATOR c53
Lee Gregor Hofmann, Warren F. Clement, and Richard E. Blodgett *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 379-387 refs (For availability see N75-19126 11-01)
(Contract F33615-71-C-1349)
CSCL 05E

Pilot instrument scanning data collected during simulated transport instrument landing approaches is examined. Deterministic features of random pilot instrument scanning behavior are confirmed to be: transitions in point of eye fixation which originate and terminate on the same instrument are rare; and transitions in point of eye fixation which originate on one secondary instrument and terminate on another secondary instrument are rare. Link value estimators are developed using statistics and these experimental facts. The result has a special significance when there is but a single primary instrument, a flight director. The result is used to simplify the iterative computational procedure of STI's display theory to a non-iterative procedure for the flight director case. Author

N75-19159* Systems Technology, Inc., Princeton, N.J.
A DIRECT PROCEDURE FOR PARTITIONING SCANNING WORKLOAD IN CONTROL DISPLAY SYSTEM DESIGN c53
W. F. Clement, L. G. Hofmann, and D. Graham *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 389-400 refs (For availability see N75-19126 11-01)
(Contract F33615-71-C-1349)
CSCL 05E

Experimental eye scanning measurements were made from simulated instrument approaches in a flight-like cockpit representing a contemporary jet transport. The procedure for predicting the partition of the pilot's scanning workload required for monitoring and controlling a task with status displays and a flight director was simplified. When there is but a single director control display, iteration in the preliminary design computations is eliminated. The preliminary design computations are based on predictions of closed-loop input-correlated errors in displayed variables with respect to the trimmed flight values. Methods for predicting multiloop error coherence, and for correcting the predicted partition of scanning workload when the pilot's scanning remnant contribution is significant are included. Author

N75-19160* Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
A LINEAR STOCHASTIC MODEL OF THE HUMAN OPERATOR c53
John C. Durrett *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 405-412 refs (For availability see N75-19126 11-01)
CSCL 05E

A linear stochastic model of the human operator is developed and applied to the problem of piloted control of an aircraft. The pilot and aircraft are modeled as linear time-invariant systems containing both process and measurement noise. The loop closure by the pilot is determined by formulating the problem as an optimal stochastic control problem. The solution to the optimal control problem yields not only the pilot's optimal control output which he uses to control the vehicle, but also the optimal combination of his observations of the vehicle states upon which the pilot bases his control. A method is presented so that, using experimental pilot vehicle data, the cost functional which is minimized in the optimal control problem will be numerically equal to the pilot rating that the pilot would associate with the given vehicle and task. Author

N75-19161* Tufts Univ., Medford, Mass. Dept. of Engineering Design.
MODELS OF MAN AS A SUBOPTIMAL PREDICTOR c53
William B. Rouse *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 413-417 refs (For availability see

N75-19126 11-01)
CSCL 05E

Models of man making predictions of future states of discrete linear dynamic systems are considered. The task is forced-pace, but the pace is slow enough to eliminate the effects of reaction time and neuromuscular lag. The best of the several models considered includes the constraints of limited memory and observation noise. Author

N75-19162* Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
ANALYSIS OF RESPONSE TO WIND-SHEARS USING THE OPTIMAL CONTROL MODEL OF THE HUMAN OPERATOR c08
Sheldon Baron *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 419-428 refs (For availability see N75-19126 11-01)
(Contract NAS2-6652)
CSCL 01C

The effects of wind-shears on the approach performance of a STOL aircraft are analyzed using the optimal-control model of the human operator. This analysis involves a time-varying situation that is more complex than is traditionally treated by human operator modelling techniques. The extensions to the time-varying case are discussed and results are presented that illustrate the effects of wind shears on category II window-performance and the effects on performance of pilot time-delay and of variations in pilot gain during approach. Author

N75-19163* Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
THE PREVIEW CONTROL PROBLEM WITH APPLICATION TO MAN-MACHINE SYSTEM ANALYSIS c54
Masayoshi Tomizuka and Daniel E. Whitney *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 429-441 refs (For availability see N75-19126 11-01)
(Grant NGR-22-009-002)
CSCL 05H

The preview control problem is formulated in a general form and its solution is obtained. The analytical tool used is discrete stochastic optimal control theory. Aiming the application to manual control situations with preview, time delay, observation noise, motor noise, etc. were included in formulating the problem. Manual preview control experiments were performed to qualitatively check the validity of the model, and it was found that the mechanism of the manual control problem was explained by the developed model. Author

N75-19164* Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
ON MODELING PERFORMANCE OF OPEN-LOOP MECHANISMS c08
T. B. Sheridan *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 443-449 refs (For availability see N75-19126 11-01)
CSCL 01C

A technique is presented for modeling the performance of open-loop mechanisms or systems, where performance is measured by success or failure as a function of the selected target for movement along a constrained trajectory and without corrective feedback. A modification of signal detection theory is used, which normalizes dissimilar data and indicates two independent parameters of performance: (1) discriminability and (2) optimality of the distribution of selected moves. An illustrative application is made to experimental data. Author

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N75-19165 Polish Academy of Sciences, Warsaw.
COMPUTATION OF AIRFOIL DRAG PROFILES [OBLICZENIA OPORU PROFILOW LOTNICZYCH]
Zenon Nowak 1974 39 p refs In POLISH
(Rept-35/1974) Avail: Issuing Activity

An algorithm is described for the automatic calculation of the drag coefficients of airfoil profiles at an angle of attack value not greater than a few degrees, a given value of the Reynolds number, and the value of the Mach number near zero. The computation also supports the classical theory of boundary layers. A computer program is presented in ALGOL 1204 language together with a description of its usage. Transl. by M.J.S.

N75-19166 Stanford Univ., Calif.
FLAPPING RESPONSE CHARACTERISTICS OF HINGELESS ROTOR BLADES BY A GENERALIZED HARMONIC BALANCE METHOD Ph.D. Thesis
David Allen Peters 1974 175 p
Avail: Univ. Microfilms Order No. 74-27083

Linearized equations of motion for the flapping response of flexible rotor blades in forward flight are derived in terms of generalized modal coordinates using the Rayleigh-Ritz method. The equations are sufficiently general to apply to hingeless or articulated rotors (with hinge offset and root spring restraint), including variable section properties and pitch-flap coupling. The aerodynamic model includes the reversed flow region, compressibility, and radial and azimuthal variations in the lift-curve slope. The basic physical characteristics of hingeless rotor response derivatives are examined. First, approximate expressions for certain rotor derivatives are obtained (with some simplifications and assumptions) to gain direct insight into hingeless rotor response mechanisms. Second, numerical results are presented to illustrate the relationships between basic rotor parameters and rotor response characteristics. Rotor response derivatives are then calculated using a variety of mathematical modeling assumptions to determine the sensitivity of the results to modeling approximations. Dissert. Abstr.

N75-19167 Stanford Univ., Calif.
ROTATION IN VIBRATION, OPTIMIZATION, AND AEROELASTIC STABILITY PROBLEMS Ph.D. Thesis
Krishna Rao Venkata Kaza 1974 193 p
Avail: Univ. Microfilms Order No. 74-27045

The governing equations of motion for the study of vibration and dynamic stability of a rapidly rotating deformable body are developed starting from the nonlinear theory of elasticity. Vibration frequencies in perpendicular planes of a rotating uniform beam inclined at an arbitrary angle of the axis of rotation are calculated. A stability analysis of this beam is performed with the angle of inclination and rotational speed as parameters. Optimum depth and the optimum mass distribution of a rotating beam with a fundamental flapping frequency and rotational speed is calculated using a numerical iterative method to solve the resulting two-point nonlinear boundary-value problem. The effect of steady coning angle and internal damping at the blade flapping hinge on whirl flutter stability in prop-rotors is investigated. The developed mathematical equations and their analyses are applied to wind tunnel models. The results indicate that these new parameters have a marked influence on stability, and that they change the critical flutter mode. The destabilizing effect of damping at the blade flapping hinge is discovered to be analogous to the effects of internal damping in gyroscopic systems. Dissert. Abstr.

N75-19168 Cincinnati Univ., Ohio.
ANALYSIS OF THICK TURBULENT JET FLOWING ROUND: A CIRCULAR CYLINDER Ph.D. Thesis
Sulaiman Owolabi Talabi 1974 123 p
Avail: Univ. Microfilms Order No. 74-27147

Analytical and experimental investigations of the flow of a thick, turbulent, and incompressible jet over a circular cylinder are carried out. A mathematical model which uses the concept of equivalent uniform velocity profile is constructed. Based on this model, radial and surface pressure distributions over the surface of the cylinder are predicted. Fekete and Guitton's empirical relation of the growth rate of turbulent jets flowing over curved surfaces is used in conjunction with some of the present experimental data to propose an analytical relation between the exit jet height and the angle of separation. Properties of the jet are studied and are graphically illustrated. Data on the separation angles for large ratios of exit jet height to radius of cylinder are

also presented. Experimental data show that, at high Reynolds numbers, the separation angle is very sensitive to the ratio of exit height to cylinder radius when that ratio is about 0.33.
Dissert. Abstr.

N75-19169 Tennessee Univ., Knoxville.
STUDY OF TRANSONIC FLOW OVER VARIOUS BODIES Ph.D. Thesis
Heinz Hermann Venghaus 1974 121 p
Avail: Univ. Microfilms Order No. 74-27245

Several inviscid transonic flow problems were analyzed and solved, by utilizing the high speed computer. The inviscid transonic flow over various frontbody-cylinder configurations, including small angles of attack, was calculated by the nonlinear-linear stretching scheme. A transonic flow theory for a conical flare was developed to determine the flow over a flared part of a body configuration in the lower transonic regime. The inviscid transonic flow field over a long cavity was calculated by a mixed finite difference scheme. An inverse computation method was applied to a compressible subsonic flow over a long cavity, to calculate the inviscid streamline to a given experimental surface pressure distribution. The method of characteristics was applied to an under-expanded jet exhaust flow for the determination of the plume boundary. Dissert. Abstr.

N75-19170 Pennsylvania State Univ., University Park.
THE DYNAMIC RESPONSE OF AIRCRAFT ENCOUNTERING AIRCRAFT WAKE TURBULENCE Ph.D. Thesis
Robert Charles Nelson 1974 170 p
Avail: Univ. Microfilms Order No. 74-28974

This investigation deals with the dynamic behavior of an airplane encountering aircraft wake turbulence. A digital computer simulation was developed to study the response of an aircraft flying into a trailing vortex wake. The simulation includes the complete six degree of freedom equations of motion, a description of the vortex velocity field, unsteady aerodynamics, and pilot control input. The parameters, varied in this simulation, include the penetration angle, separation distance, aircraft size (for both the penetrating and generating aircraft), and pilot control input (single- or multi-axes). Predicted vortex induced motions are presented for a variety of probe aircraft. The probe aircraft selected are representative of general aviation, business, and light jet transport type aircraft. The aircraft used to generate the vortex wakes are representative of the commercial transport fleet. The computer predictions indicate that relatively large aircraft (light jet transport) can experience unacceptable vortex-induced roll excursions. Dissert. Abstr.

N75-19171 Arizona Univ., Tucson.
UNSTEADY VISCOUS FLOW PAST A LIFTING PLATE Ph.D. Thesis
Robert Anthony Schmall 1974 200 p
Avail: Univ. Microfilms Order No. 74-28305

A technique for the analysis of unsteady viscous fluid flows past aerodynamic shapes is reported. The utility of this technique, called the vorticity source method, is demonstrated by application to the two-dimensional, constant property flow created by a finite chord flat plate that is impulsively accelerated from rest to a constant velocity. The plate is maintained at a constant angle of attack alpha, as measured between the plate chord and the velocity vector of the plate. The flow field development with time is calculated, using numerical solutions to the vorticity transport equation. The fluid far from the plate is at rest. Adopting elements of inviscid aerodynamic theory, the velocity field is related to the vorticity field through the Biot-Savart Law. The method also allows the numerical computations to be confined to the region of non-zero vorticity near the plate. This latter consideration is an advantage not found in conventional approaches based on the stream function. Dissert. Abstr.

N75-19172*# Iowa State Water Resources Research Inst., Ames. Engineering Research Inst.
INVISCID TO TURBULENT TRANSITION OF TRAILING VORTICES
James D. Iversen Nov. 1974 30 p refs
(Grant NsG-2040; ERI Proj. 1146-S)
(NASA-CR-142298; ISU-ERI-Ames-74241) Avail: NTIS HC $3.75 CSCL 01A

The characteristics of the plateau region in the vortex system which trails from a lifting wing are discussed. The decay of the vortex due to viscous or turbulent shear is very slow in the plateau so that the maximum tangential speed in the vortices remains nearly constant for some distance downstream of roll-up and then begins to decrease, becoming inversely proportional to the square root of the distance downstream. Mathematical models are developed to analyze the structure of the plateau area. Solutions are obtained for both constant and variable eddy viscosity models. Author

N75-19173*# MacNeal-Schwendler Corp., Los Angeles, Calif.
IMPROVEMENTS TO THE SADSAM COMPUTER PROGRAM FOR AEROELASTICITY ANALYSIS
Robert G. Schwendler Mar. 1975 29 p refs
(Contract NAS1-12017)
(NASA-CR-132617) Avail: NTIS HC $3.75 CSCL 01A

A computer program for calculating the elastic element forces and strain energy distribution for normal mode shapes is presented. The subjects discussed are: (1) revised aerodynamic force representation, (2) flap aerodynamics, (3) chordwise motions and aerodynamic forces, (4) wing-tail interaction, and (5) gust analysis. An aircraft configuration used in sample gust analysis is included. Author

N75-19174# National Aerospace Lab., Tokyo (Japan).
A METHOD FOR PREDICTING UNSTEADY AERODYNAMIC FORCES ON OSCILLATING WINGS WITH THICKNESS IN TRANSONIC FLOW NEAR MACH NUMBER 1. PART 1: TWO-DIMENSIONAL THEORY. PART 2: RECTANGULAR WINGS
Koji Isogai Jun. 1974 35 p refs
(NAL-TR-368T-Pt-1; NAL-TR-368T-Pt-2) Avail: NTIS HC $3.75

An approximate method for predicting aerodynamic loadings on circular-arc airfoils oscillating in two-dimensional transonic flow at Mach number 1 or very near 1 is presented. Employing an idea analogous to the local linearization concept, a linear partial differential equation with variable coefficients for an unsteady small disturbance velocity potential is transformed into an approximate integral equation, which relates an unknown load distribution to a normalwash condition. A method for solving the integral equation is discussed and its working form is given together with appropriate forms of the kernel functions for numerical evaluation. Aerodynamic forces on circular-arc airfoils oscillating at Mach number 1 are calculated for several values of thickness to chord ratio and compared with those predicted by the sonic theory. A considerable effect of the airfoil thickness on both the magnitudes and phase angles of the aerodynamic forces is found, especially in the reduced frequency range from 0 to 0.2, where flutter usually occurs. Aerodynamic forces predicted by the present method are applied to a flutter calculation of a rectangular wing, and the effects of airfoil thickness on the flutter speed, which were observed in the experiment, are well predicted by the present method. Author

N75-19175# Cranfield Inst. of Technology (England). Coll. of Aeronautics.
LONGITUDINAL AERODYNAMIC DERIVATIVES OF A SLENDER DELTA WING RESEARCH AIRCRAFT EXTRACTED FROM FLIGHT DATA
V. Klein Jul. 1974 85 p refs
(Cranfield-Aero-27) Avail: NTIS HC $4.75

The Maximum Likelihood parameter-estimation algorithm was used to extract the longitudinal aerodynamics derivative from flight data for the Handley Page HP 115 slender delta-wing research aircraft. The responses in the rate of pitch and vertical acceleration were excited from the horizontal steady-state flights at different air speeds by the elevon deflection. In some cases the measured time histories were converted into frequency response curves, from which the unknown parameters were estimated. For the low angle of attack measurements the linear model of the aircraft was adequate, whereas for the runs measured at high angle of attacks the non-linear model had to be used. Some indentifiability problems were met because of the limited number of measured outputs and incorrect design of the experiment. The non-dimensional aerodynamic derivatives extracted were compared with those from wind-tunnel tests and

steady-state measurements. A reasonable degree of consistency between the various sets of results was obtained. Author

N75-19176# National Aerospace Lab., Tokyo (Japan).
AN EXACT SOLUTION FOR TRANSONIC POTENTIAL FLOW PAST AEROFOIL SECTIONS
Susumu Takanashi Aug. 1974 31 p refs In JAPANESE; ENGLISH summary
(NAL-TR-383) Avail: NTIS HC $3.75

A hodograph method is developed for obtaining exact solutions of transonic potential flow around lifting airfoils. The procedure of constructing compressible flows from incompressible flows is based on those of Lighthill and Nieuwland. In the present theory, however, the complex hodograph potential representing the starting incompressible flow is divided into two parts; one is a simple function which has the desired singularity of dipole and vortex at the point corresponding to infinity in the physical plane, and the other is chosen to be a regular function so that the total function represents a flow around a pseudo-elliptical body. This splitting of the solution has many advantages from the mathematical and computational points of view. The geometrical and aerodynamical characteristics of the resulting airfoils in the compressible flow are controlled by a number of parameters. A family of practically interesting transonic shock-free airfoils has been computed by changing the values of these parameters. An airfoil of this family was tested in the wind tunnel to compare with the theoretical prediction. Author

N75-19177# Cranfield Inst. of Technology (England). Coll. of Aeronautics.
PARAMETER IDENTIFICATION APPLIED TO AIRCRAFT
V. Klein [1974] 153 p refs
(Cranfield-Aero-26) Avail: NTIS HC $6.25

All three steps in the identification, namely characterization, parameter estimation and verification are considered and applied to the determination of aircraft parameters from flight data. The estimation procedure includes the equation error method and the output error method with the weighted least squares, maximum likelihood and Bayesian estimation technique. The problems concerning accuracy and identifiability are also discussed. A general computing algorithm is developed covering all estimation techniques described. It is applicable to linear as well as nonlinear systems and is flexible enough for the solution of various identifiability problems. Using this algorithm the computing program has been compiled in general terms to enable the user to achieve the objectives mentioned. As examples, the results of the identification of aircraft parameters and aerodynamic derivatives for four different aircraft are presented. They include the analysis of flight data from the Basset variable stability aircraft and the simulated data for a nonlinear model of the F-100 aircraft, and the flight data from the longitudinal motion of the HP-115 slender delta-wing research aircraft. Author

N75-19178*# TRW Systems, Redondo Beach, Calif. Applied Mechanics Dept.
TRW VORTEX-LATTICE METHOD SUBSONIC AERODYNAMIC ANALYSIS FOR MULTIPLE-LIFTING-SURFACES (N. SURFACE) TRW PROGRAM NUMBER HA010B
Antulio V. Gomez 1 Sep. 1972 266 p refs
(Contract NAS9-12330)
(NASA-CR-128588; TRW-20029-H110-R0-00) Avail: NTIS HC $8.50 CSCL 01A

The program was designed to provide solutions of engineering accuracy for determining the aerodynamic loads on single- or multiple-lifting-surface configurations that represent vehicles in subsonic flight, e.g., wings, wing-tail, wing-canard, lifting bodies, etc. The preparation is described of the input data, associated input arrangement, and the output format for the program data, including specification of the various operational details of the program such as array sizes, tape numbers utilized, and program dumps. A full description of the underlying theory used in the program development and a review of the program qualification tests are included. Author

N75-19179*# Kanner (Leo) Associates, Redwood City, Calif.
DYNAMICS OF THE MOTION OF A BODY WITH ALLOWANCE FOR THE UNSTEADY STATE OF THE FLOW ABOUT IT
S. M. Belotserkovskiy, Yu. A. Kochetkov, and V. K. Tomshin Washington NASA Feb. 1975 17 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Mekh. Tverd. Tela (USSR), May-Jun. 1974 p 35-43
(Contract NASw-2481)
(NASA-TT-F-16133) Avail: NTIS HC $3.25 CSCL 01A

A numerical method and an approximate method based on the approximation of transient aerodynamic functions by exponential curves are proposed for the solution of the integrodifferential equations to which some dynamics problems reduce. The approximate method leads to systems of ordinary differential equations with constant coefficients. The methods are applied to solving three problems in flight dynamics. Solutions of exact equations are analyzed. Author

N75-19180*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INTEGRATION OF AFT-FUSELAGE-MOUNTED FLOW THROUGH ENGINE NACELLES ON AN ADVANCED TRANSPORT CONFIGURATION AT MACH NUMBERS FROM 0.6 TO 1.0
Bernard J. Blaha Washington Mar. 1975 72 p refs
(NASA-TM-X-3178) Avail: NTIS HC $4.25 CSCL 01C

An approximately 1/30th-scale model of a CTOL aircraft designed for efficient cruise between Mach 0.9 and 0.98 was tested in the Lewis Research Center's 8- by 6-Foot Supersonic Wind Tunnel. Aft-fuselage axial force and pressure were measured for a series of locally area-ruled engine installations. Two flow-through nacelles with different exit diameters which simulated inlet mass flow ratios of 0.46 and 0.6 (based on maximum nacelle cross-sectional) area were investigated. Both an NACA-1 cowl and a blunter supercritical cowl were tested with these nacelles. Variations in the amount of local area ruling were investigated and an aft fuselage without nacelles was tested for reference. Results observed with flow-through nacelles indicate that efficient cruise may be obtained on this type of aircraft with aft-fuselage-mounted engine nacelles. Author

N75-19181*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EXPERIMENTAL AERODYNAMIC CHARACTERISTICS FOR A CYLINDRICAL BODY OF REVOLUTION WITH SIDE STRAKES AND VARIOUS NOSES AT ANGLES OF ATTACK FROM 0 DEGREES TO 58 DEGREES AND MACH NUMBERS FROM 0.6 TO 2.0
Leland H. Jorgensen and Edgar R. Nelson Washington Mar. 1975 88 p refs
(NASA-TM-X-3130; A-5759) Avail: NTIS HC $4.75 CSCL 01A

For a body of revolution with afterbody side strakes, an experimental investigation was conducted in the Ames 6- by 6-Foot Wind Tunnel to determine the effects on the aerodynamic characteristics of forebody geometry, nose strakes, body side strakes, Reynolds number, Mach number, and angle of attack. Aerodynamic force and moment characteristics were measured for the straked cylindrical afterbody (cylinder fineness ratio of 7) with tangent ogive noses of fineness ratio 2.5 to 5.0. In addition, the straked cylinder afterbody was tested with an ogive nose having a rounded tip and an ogive nose with two different nose strake arrangements. The data demonstrate that the aerodynamic characteristics for a body of revolution with side strakes can be significantly affected by changes in nose fineness ratio, nose bluntness, Reynolds number, Mach number, and, of course, angle of attack. Removing the strakes from the cylindrical aftersection greatly decreased the lift, but this removal hardly changed the maximum magnitudes of the undesirable side forces that developed at angles of attack greater than about 25 deg for subsonic Mach numbers. Author

N75-19182*# Linguistic Systems, Inc., Cambridge, Mass.
MECHANICS OF OPTIMUM THREE-DIMENSIONAL MOTION OF AIRCRAFT IN THE ATMOSPHERE
L. M. Shkadov, R. S. Bukhanova, V. F. Illarionov, and V. P. Plokhikh Washington NASA Mar. 1975 288 p refs Transl. into ENGLISH of the book "Mekhanika optimalnogo prostranstvennogo dvizheniya letatelnykh apparatov v atmosfere" Moscow, Mashinostroyeniye Press, 1972 240 p
(Contract NASw-2482)

(NASA-TT-F-777) Avail: NTIS HC $8.75 CSCL 01C

The theoretical bases are presented for the method of investigating an optimum three-dimensional maneuver of a hypersonic aircraft with the use of aerodynamic forces in motion in the atmosphere of a planet. The application of the method is illustrated by the solution of a number of specific problems associated with the maneuver: maximization of lateral range (slant range) in the launching of an orbiting craft (missiles) (in the absence and in the presence of limitations with respect to the heating temperature of the structure); rotation of the plane of the orbit by means of aerodynamic forces, and landing at a given point on the earth's surface. Author

N75-19183*# Franklin Inst. Research Labs., Philadelphia, Pa.

WIND TUNNEL TESTS OF A SYMMETRICAL AIRFOIL WITH SCOOP FED SLOTS

Charles A. Belsterling Nov. 1974 55 p ref

(Contract NAS1-12451)

(NASA-CR-132568; FIRL-C-3741-2) Avail: NTIS HC $4.25 CSCL 01A

The design and wind tunnel test of a model vertical tail fin is described in this report. The model is designed to provide the aerodynamic forces necessary for lateral stabilization without moving parts or a separate source of power. It employs scoop-fed slots on both surfaces of the symmetrical airfoil. They are to be controlled differentially by means of a fluidic amplifier to implement an automatic fulltime lateral stabilization system. The results of tests show that the control of forces is stable and quite linear in various modes of operation. Significant forces were produced that can be increased as necessary by increasing slot size and scoop size. Slots can be located ahead of the conventional rudder and the scoop can be at the base of the vertical tail fin to avoid the need for major changes in conventional aircraft design. The first phase of the work demonstrated the feasibility of no-moving-parts aircraft control. The second phase established that a practical fluidic amplifier can be built to control slot flows from fluidic signals. Recommendations are made to optimize the design of the fluidic amplifier and to characterize its dynamic response in support of further analytical studies. Author

N75-19184*# Boeing Commercial Airplane Co., Seattle, Wash.

LOW SPEED AND ANGLE OF ATTACK EFFECTS ON SONIC AND NEAR-SONIC INLETS

T. E. Hickcox, R. L. Lawrence, J. Syberg, and D. R. Wiley Mar. 1975 207 p refs

(Contract NAS3-18035)

(NASA-CR-134778; D6-42392) Avail: NTIS HC $7.25 CSCL 01A

Tests of the Quiet, Clean Short-Haul Experimental Engine (QCSEE) were conducted to determine the effects of forward velocity and angle of attack on sonic and near-sonic inlet aerodynamic performance penalties and acoustic suppression characteristics. The tests demonstrate that translating centerbody and radial vane sonic inlets, and QCSEE high throat Mach number inlets, can be designed to operate effectively at forward speed and moderate angle of attack with good performance and noise suppression capability. The test equipment and procedures used in conducting the evaluation are described. Results of the tests are presented in tabular form. Author

N75-19185# Cambridge Univ. (England). Dept. of Engineering.

LIFTING SURFACE THEORY FOR A ROTATING SUBSONIC OR TRANSONIC BLADE ROW

M. Namba London ARC 1974 77 p refs Supersedes ARC-34126; ARC-34127 Sponsored in part by the Roy. Soc. of London

(ARC-R/M-3740; ARC-34126; ARC-34127) Avail: NTIS HC $4.75; HMSO £2.95; PHI $11.55

A lifting-surface method is presented for calculating the disturbance velocity and pressure fields as well as the aerodynamic lift distributions for a rotating thin blade row in a cylindrical duct at subsonic or transonic relative Mach numbers on the basis of an inviscid, isentropic, small disturbance three-dimensional flow theory. The most significant features of the method stem from a new mathematical treatment of the Fourier-Bessel double series, which consists of re-expanding radial eigenfunctions, i.e., Bessel functions, of an arbitrary circumferential order in terms of a set of radial eigenfunctions of the zero-th order in the same family. This permits the separation of the singular parts and the treatment of essentially a finite number of unknown parameters in solving the off-design problem. Some numerical examples of solutions of the off-design problem of a subsonic lifting blade row are presented, and the validity of the two-dimensional blade element concept, as well as the importance of various three-dimensional factors, are discussed. The analysis is also given for a transonic lifting blade row in which the relative Mach numbers at the blade tip exceed unity. The new mathematical treatment has turned out to be powerful in discriminating the supersonic singular parts from the subsonic ones. Numerical results are presented, which illustrate the comparison between the present lifting-surface theory and the strip theory and demonstrate the special features of the flows in transonic and supersonic axial compressors. It is found that the three-dimensional effects, i.e., the departure from the strip theory is greatest near the sonic radius. Author (ESRO)

N75-19186# East Anglia Univ., Norwich (England). School of Mathematics and Physics.

FLOW PAST CONICALLY-CAMBERED SLENDER DELTA WINGS WITH LEADING-EDGE SEPARATION

J. E. Barsby London ARC 1974 50 p refs Supersedes RAE-TR-72179; ARC-34435 Monitored by RAE, Farnborough, Engl.

(ARC-R/M-3748; RAE-TR-72179; ARC-34435) Avail: NTIS HC $3.75; HMSO £1.95; PHI $7.65

The vortex sheet model of leading edge separation previously applied to uncambered delta wings was applied to thin, conically cambered delta wings whose cross sections are circular arcs. The simplifications introduced by the use of slender body theory and an asymptotic treatment for the core of the vortex were retained. Solutions were found showing a gradual growth of the leading edge vortex above the upper surface at incidences above that for attached flow for wings between the flat plate and the semi-circular cone. Variations of the shape and strength of the vortex sheet, the pressure distribution on the wing, and the lift and drag of the wing with camber and incidence are displayed. An attempt is made to relate the lifting efficiency of the wing to both the distribution of pressure over its surface and to the vorticity shed from its edges. The results support the choice of an attachment lift coefficient approximately half that at which the best performance is desired. Author (ESRO)

N75-19187# Royal Aircraft Establishment, Farnborough (England). Structures Dept.

CALCULATIONS OF GENERALISED AIRFORCES ON TWO PARALLEL LIFTING SURFACES OSCILLATING HARMONICALLY IN SUBSONIC FLOW

D. E. Davies London Aeron. Res. Council 1974 86 p refs Supersedes RAE-TR-72180; ARC-34466

(ARC-R/M-3749; RAE-TR-72180; ARC-34466) Avail: NTIS HC $4.75; HSMO £3.35; PHI $12.95

Two flat parallel surfaces, oscillating harmonically about a mean configuration were immersed in a uniform subsonic main stream in a direction parallel to the surfaces. The linearized equations of potential flow were assumed to be valid, so that the upwash on the surfaces could be related to the loading on the surfaces by means of a pair of integral equations. This pair of integral equations was solved, by collocation, for approximations to the loadings in terms of given upwashes and these approximations were used to evaluate generalized airforces. The results were compared with some results obtained by other numerical procedures and with some experimental results. Author (ESRO)

N75-19188# Royal Aircraft Establishment, Farnborough (England). Aerodynamic Dept.

NOTES ON THE APPROXIMATE SOLUTION OF LIFTING-SURFACE THEORY USED IN THE RAE STANDARD METHOD

J. Weber London ARC 1974 71 p refs Supersedes RAE-TR-73044; ARC-34766

(ARC-R/M-3752; RAE-TR-73044; ARC-34766) Avail: NTIS HC $4.25; HMSO £2.80; PHI $11.00

The downwash induced by planar vorticity distributions was computed by exact linear theory and by the RAE Standard Method to examine the accuracy of the approximate method. The results

on wings of infinite span with load distributions which are uniform across the span were used to derive a modification of the downwash equation of the approximate method. It is shown that this modification can explain some of the difference between the exact and the approximate results for the spanwise lift coefficient distribution of a plane wing of infinite span at an angle of incidence. The downwash distributions on finite wings of constant chord, unswept and sweptback by 45 degrees, with given load distributions, computed by the exact and the approximate method are compared. The lift distribution for wings of given shape derived by the approximate method is also compared with more accurate results. Author (ESRO)

N75-19189# Royal Aircraft Establishment, Farnborough (England). Structures Dept.

BOUNDARY-LAYER PRESSURE FLUCTUATIONS AT HIGH REYNOLDS NUMBERS ON A SECOND FREE-FLIGHT TEST VEHICLE

D. R. Roberts London Aeron. Res. Council Feb. 1974 103 p refs Supersedes RAE-TR-74029; ARC-35404
(ARC-CP-1302; RAE-TR-74029; ARC-35404) Avail: NTIS HC $5.25; HMSO £1.70; PHI $6.75

Measurements were made of the boundary layer pressure fluctuations at two positions on the body of a free flight aerodynamic test vehicle powered by a solid fuel rocket motor. The vehicle reached a maximum Mach number of 2.2 with a maximum Reynolds number of about 118 millions at the front measuring station and 207 millions at the rear. Pressure spectra were deduced, and were found to compare reasonably with a theoretical spectrum. The scale of the boundary layer turbulence fluctuates appreciably but is for the most part between 30% and 80% of the turbulence boundary layer thickness for all Mach numbers up to 2.2. The root mean square boundary layer pressure reduced with Mach number from about 0.01 times the free stream dynamic pressure at M = 1 to about 0.003 at M = 2.2, the front station tending to be slightly the higher at each Mach number. Author (ESRO)

N75-19190# Imperial Coll. of Science and Technology, London (England). Dept. of Aeronautics.

USERS' GUIDE TO THE GIBSON-SPALDING AND GREEN PROGRAMS FOR THE CALCULATION OF COMPRESSIBLE TURBULENT BOUNDARY LAYERS WITH PRESSURE GRADIENT AND HEAT TRANSFER

C. Osborne Mar. 1973 89 p refs
(IC-Aero-73-01) Avail: NTIS HC $4.75

The use of two programs for the calculation of compressible turbulent boundary layers is described. The first is that of Gibson and Spalding who modified the basic Patankar-Spalding finite difference program for use with the k-w model of turbulence. The second is for the integral method of Green, who extended the entrainment ideas of Head to compressible flow. Both programs may be used for axisymmetric and two-dimensional flows including the effect of heat transfer and pressure gradients. Author (ESRO)

N75-19191# Imperial Coll. of Science and Technology, London (England). Dept. of Aeronautics.

CALCULATION OF TWO-DIMENSIONAL AND AXISYMMETRIC BLUFF BODY POTENTIAL FLOW

P. W. Bearman and J. E. Fackrell Oct. 1974 44 p refs Sponsored partly by a Donald Campbell Res. Fellowship
(IC-Aero-74-07) Avail: NTIS HC $3.75

A numerical method for calculating the incompressible potential flow external to a bluff body and its wake is presented. The effect of the wake is modeled by placing sources on the rear of the wetted surface of the body. The body shapes that can be treated are not limited by the restrictions imposed by the use of conformal transformation. The wetted surface of the body is represented by a distribution of discrete vortices. Good agreement was found between the pressure distributions predicted by the numerical method and the analytic expressions of Parkinson and Jandali for a two-dimensional circular cylinder, flat plate and ellipse. The method was extended to axisymmetric bluff bodies and the results show good agreement with measured pressure distributions on a circular disc and a sphere.
Author (ESRO)

N75-19192# Imperial Coll. of Science and Technology, London (England). Dept. of Aeronautics.

A WAKE SOURCE MODEL FOR AN INCLINED FLAT PLATE IN A UNIFORM STREAM

M. E. Davies Sep. 1974 14 p refs Sponsored by Sci. Res. Council
(IC-Aero-74-08) Avail: NTIS HC $3.25

The wake-source potential flow model for bluff bodies, suggested by Parkinson and Jandali, was extended to the nonsymmetric case of an inclined flat plate in a uniform stream. For angles of inclination up to 60 or 70 degrees, the theory predicts the surface pressure distribution to a reasonable degree of accuracy (normal flat plate alpha 0). Author (ESRO)

N75-19193# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.

ON THE CALCULATION OF NON-LINEAR AERODYNAMIC CHARACTERISTICS AND THE NEAR VORTEX WAKE

Josef Rom, Carlos Zorea, and Rachel Gordon Aug. 1974 18 p refs Presented at the 9th Proc. of Congr. Intern. Council of Aeron. Sci., Haifa, Israel, 25-30 Aug. 1974
(Grant AF-AFOSR-2145-71; AF Proj. 9781)
(AD-A002161; AFOSR-74-1766TR; ICAS-Paper-74-27) Avail: NTIS CSCL 01/1

This investigation presents methods for the calculation of the distribution of vortices on the wing planform and on the trailing vortex wake by iterative procedures based on the application of the vortex lattice method concepts. In the case when the trailing vortices are taken to leave the wing at the trailing edge only the calculation results in determining the linear aerodynamic characteristics and the shape of a rolled up wake. The present investigation considers the cases when the vortices from each cell are allowed to leave the wing planform at a fixed angle, and the case when the vortex shedding can be limited to the planform edges only. In these cases non-linear aerodynamic characteristics are evaluated. The corresponding trailing vortex wakes were first calculated by using discrete ideal vortices. It is now proposed to use a finite core vortex model thereby eliminating some of the numerical problems associated with the use of the ideal vortices. GRA

N75-19194# Army Aviation Systems Test Activity, Edwards AFB, Calif.

NATURAL ICING TESTS. UH-1H HELICOPTER Final Report

Warren E. Griffith, II, Marvin L. Hanks, Carl F. Mittag, and James S. Reid Jun. 1974 36 p refs
(AD-A002077; USAASTA-74-31) Avail: NTIS CSCL 01/2

A limited evaluation of the capability of a modified UH-1H helicopter to fly in a natural icing environment was conducted at Fort Lewis, Washington, from 5 February through 23 February 1974. Testing was performed by the United States Army Aviation Systems Test Activity and consisted of 1.7 hours in icing conditions. During this test, four enhancing features, one deficiency, and one shortcoming were noted. There were four enhancing features associated with special equipment. The deficiency is the inability to maintain autorotational rotor speed within operational limits with main rotor ice accumulation. The striking of the tail rotor by the oscillating iced FM antenna is a shortcoming. Based on these tests, artificial icing characteristics observed in previous UH-1H icing tests are representative of natural icing characteristics. The UH-1H helicopter does not possess the capability to operate safely in an icing environment. GRA

N75-19195# Summa Corp., Culver City, Calif. Hughes Helicopter Div.

DYNAMIC LOADS AND STRUCTURAL CRITERIA STUDY Final Report, Dec. 1973 - May 1974

K. R. Spreuer, S. J. Snackenburg, and G. D. Roeck Sep. 1974 131 p refs
(Contract DAAJ02-74-C-0018; DA Proj. 1F1-62208-AH-90)
(AD-A001739; HH-74-124; USAAMRDL-TR-74-74) Avail: NTIS CSCL 01/3

This report presents the results of a 6-month technical effort to develop a realistic mission profile for each of six helicopter types in current and future Army inventories: observation, utility, utility/tactical assault, attack, crane, and transport. The

profiles included in this report are the product of operational data gathered over two decades, starting with early NACA efforts and including extensive studies conducted by the Army Air Mobility R and D Laboratory and private enterprise. GRA

N75-19196# ARO, Inc., Arnold Air Force Station, Tenn.
APPLICATION OF THE LASER VELOCIMETER FOR TRAILING VORTEX MEASUREMENTS Final Report, Oct. 1970 - Jul. 1973
A. E. Lennert, F. L. Crosswy, and H. T. Kalb Dec. 1974 168 p refs Sponsored by AEDC
(ARO Proj. BF241)
(AD-A002151; AEDC-TR-74-26) Avail: NTIS CSCL 01/1

This report summarizes a three-year analytical and experimental program to develop a dual-scatter laser velocimeter system to map the flow fields of trailing vortices stemming from the wingtips of flying aircraft. The basic design parameters ascertaining feasibility of the LV-measuring technique are presented. Included is a discussion and evaluation of a newly developed two-dimensional Bragg cell (TDBC) for resolving directional ambiguity. The electronics instrumentation developed for the operation of the TDBC is evaluated in detail. In addition, the development of a direct readout system yielding considerable improvement over the initial instrument is described and evaluated. GRA

N75-20208 European Space Research Organization, Paris (France).
PRODUCTION OF VORTICITY BY INTERACTION OF A SOUND FIELD AND A FLUID LAYER WITH VARIABLE ENTROPY
Henri Burnage *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1974-2 (ESRO-TT-113) Dec. 1974 p 1-14 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1974-2, Mar.-Apr. 1974 p 69-73 (For availability see N75-20207 11-99)

N75-20209 European Space Research Organization, Paris (France).
THE COEXISTENCE OF TWO SUPERSONIC PLANE FLOWS IN THE PRESENCE OF A LONGITUDINAL PRESSURE GRADIENT
Jacques Paulon, Xavier Garonne et al *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1974-2 (ESRO-TT-113) Dec. 1974 p 15-34 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1974-2, Mar.-Apr. 1974 p 75-82 (For availability see N75-20207 11-99)

N75-20213 European Space Research Organization, Paris (France).
DETERMINATION BY MEANS OF HYDRAULIC ANALOGY OF THE TRANSONIC FLOW IN A BLADE CASCADE
Emilien Robert, Lucien Reding et al *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1974-2 (ESRO-TT-113) Dec. 1974 p 89-101 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1974-2, Mar.-Apr. 1974 p 108-112 (For availability see N75-20207 11-99)

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

N75-19197 Stanford Univ., Calif.
ANALYSIS OF IN-FLIGHT DISINTEGRATION ACCIDENTS Ph.D. Thesis
Frederick Harold Matteson 1974 316 p
Avail: Univ. Microfilms Order No. 74-27058

Patterns of wreckage resulting from the disintegration of aircraft in flight have been studied to aid in accident investigations. Emphasis has been given to general aviation accidents where economic losses are highest and showing little improvement, and where flight recorders are seldom used. Idealized wreckage patterns were generated by solution of ballistic trajectory equations for bodies with differing terminal velocities. Effects of changes in initial flight and wind variables on simultaneous distintegrations in atmospheres with uniform winds were shown by means of easily comprehended diagrams. The technique was then extended to progressive breakups and to the effects of altitudinal variations in the wind speed and direction, using wind profiles based on meteorological records. Dissert. Abstr.

N75-19198# Stanford Research Inst., Menlo Park, Calif.
FEASIBILITY OF LASER SYSTEMS FOR AIRCRAFT LANDING OPERATIONS UNDER LOW VISIBILITY CONDITIONS Final Report
William Viezee, John Oblanas, and Myron Glaser 11 Oct. 1974 116 p refs
(Contract DOT-FA73WA-3214; SRI Proj. 2831)
(AD-A005637; FAA-RD-74-190) Avail: NTIS HC $5.25

The effects of currently recommended eye-safety standards and of atmospheric scattering on the potential application of lasers to the low-visibility aircraft approach and landing operational environment are assessed. It is concluded that these two criteria are serious handicaps in any proposed development of a laser landing guidance system. The two criteria are interrelated: the application of high power, narrow beam lasers to overcome the large attenuation in dense fog increases the eye-safety hazard, whereas a lowering of laser power to guarantee eye-safety drastically reduces the distance over which the laser beam can be used effectively. Since the scattering coefficient during conditions of fog is essentially independent of wavelength, no laser wavelength that also falls within an absorption-free 'window', appears to be significantly better than any other wavelength as far as penetration in fog is concerned. The results of our evaluation of lasers as visual cues or optical guidance systems are based primarily on the performance characteristics of optical lasers under operationally important low-visibility conditions. Author

N75-19199# Princeton Univ., N.J. Dept. of Aerospace and Mechanical Science.
GENERAL AVIATION AIRCRAFT SAFETY
Oct. 1974 150 p Presented at Princeton Univ. Conf. Meeting no. 119, Princeton, N. J., 24-25 Oct. 1973 Sponsored by FAA
(AD-A003124; FAA-RD-74-154) Avail: NTIS HC $6.25

The proceedings of a conference on General Aviation Aircraft Safety are presented. Emphasis was placed on current research and development efforts in the areas of airworthiness and crashworthiness. The cost and regulatory implications of increased safety were examined. The general aviation accident record was reviewed to show accident patterns and pilot error influences. The prospects for improved safety records were discussed to show the contributions which can be made by the manufacturers. For individual titles, see N75-19200 through N75-19207.

N75-19200 National Transportation Safety Board, Washington, D.C. Bureau of Aviation Safety.
ANALYSIS OF GENERAL AVIATION ACCIDENT RECORDS
Charles O. Miller *In* Princeton Univ. Gen. Aviation Aircraft Safety Oct. 1974 p 5-11 (For availability see N75-19199 11-03)

The system for investigating aircraft accidents involving general aviation aircraft is discussed. The functions of the National Transportation Safety Board are defined. The procedures for processing data pertaining to general aviation aircraft are examined to show the manner in which the information is used to improve flight safety. Data are tabulated to show the rank and percentage of general aviation aircraft during 1970, 1971, and 1973 based on accidents caused by: (1) personnel, (2) weather, (3) power plant, (4) terrain, and (5) airframe. Author

N75-19201 Federal Aviation Administration, Washington, D.C.
GENERAL AVIATION ACCIDENT PATTERNS
Donald E. Kemp *In* Princeton Univ. Gen. Aviation Aircraft Safety Oct. 1974 p 12-16 (For availability see N75-19199 11-03)

The importance of aircraft design and standardization to the education and prevention of aircraft accidents is discussed. Several examples of aircraft accidents resulting from lack of

standardization of aircraft controls are presented. The importance of education and training for flying personnel as an accident prevention measure are stressed. Author

N75-19202 Ohio State Univ., Columbus. Dept. of Aviation.
THE ACCIDENT RECORD IN TERMS OF THE PILOT
Jack J. Eggspuehler *In* Princeton Univ. Gen. Aviation Aircraft Safety Oct. 1974 p 17-36 (For availability see N75-19199 11-03)

General aviation aircraft accidents are reviewed from the standpoint of pilot performance and pilot error. The importance of adequate pilot education and training to prevent aircraft accidents is stressed. Several examples of aircraft accidents which resulted from incorrect pilot decisions and actions are presented. Author

N75-19203 Federal Aviation Administration, Washington, D.C.
CRASH SURVIVABILITY
P. Frank Castellon *In* Princeton Univ. Gen. Aviation Aircraft Safety Oct. 1974 p 37-45 (For availability see N75-19199 11-03)

A research project to improve the crash survivability of general aviation aircraft is discussed. Structural design criteria for aircraft components which will aid in crash survival are described. Various restraint mechanisms such as seat belts, shoulder harnesses, air bags, and combinations of these devices are examined. Test equipment for conducting full scale drop and impact tests of aircraft to evaluate restraint equipment is proposed. Author

N75-19204 Princeton Univ., N.J. Dept. of Aerospace and Mechanical Sciences.
GENERAL AVIATION HANDLING QUALITIES RESEARCH
David R. Ellis *In its* Gen. Aviation Aircraft Safety Oct. 1974 p 46-58 (For availability see N75-19199 11-03)

Research projects to reduce the accident rate for general aviation aircraft by improving aircraft control and handling qualities are discussed. Various items of aircraft equipment which are designed to provide solutions to control problems are described. Flight tests of specific aerodynamic configurations to determine the effectiveness of modifications to control surfaces are reported. Efforts to improve the landing safety of aircraft under adverse conditions are reported. Author

N75-19205* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DESIGN CONSIDERATIONS FOR STALL/SPIN AVOIDANCE
Seth B. Anderson *In* Princeton Univ. Gen. Aviation Aircraft Safety Oct. 1974 p 59-76 (For availability see N75-19199 11-03)

The paper discusses three aspects of the stall/spin problem: (1) aerodynamic effects, (2) stall warning, and (3) stall limiting. The results show that the stall/spin problem could be alleviated by good handling qualities up to and beyond the stall, careful selection of aerodynamic parameters which promote spin-resistance, adequate stall warning methods and stall margins, and an acceptable form of limiting elevator effectiveness near the maximum coefficient of lift. Author

N75-19206 Federal Aviation Administration, Washington, D.C.
ECONOMICS: GENERAL AVIATION COST FACTORS
Gene S. Mercer *In* Princeton Univ. Gen. Aviation Aircraft Safety Oct. 1974 p 94-100 (For availability see N75-19199 11-03)

A study to determine the economic factors which influence the growth of general aviation was conducted. Emphasis was placed on the costs arising from changes in the Federal regulatory environment and higher Federal aviation user charges. The study developed a data base of ownership and operating costs in each segment of general aviation. Regression equations were developed which related the demand for aircraft and flight hours to the appropriate cost categories. Charts are included to show the various factors in aircraft operation which have an economic impact. Author

N75-19207 General Aviation Manufacturers Association, Washington, D.C.
MANUFACTURER'S OVERVIEW
Edward W. Stimpson *In* Princeton Univ. Gen. Aviation Aircraft Safety Oct. 1974 p 117-120 (For availability see N75-19199 11-03)

The contribution of aircraft manufacturers to improved safety of general aviation aircraft is discussed. An analysis of the overall accident rate for general aviation aircraft is presented. Federal and state programs to provide better navigation aids and terminal facilities are reported. Research projects conducted by aircraft manufacturers to provide increased aircraft reliability are reported. Author

N75-19208*# Manned Systems Sciences, Inc., Northridge, Calif.
A STUDY OF CARBURETOR/INDUCTION SYSTEM ICING IN GENERAL AVIATION ACCIDENTS Final Report
Richard W. Obermayer and William T. Roe Mar. 1975 47 p refs
(Contract NAS4-2191)
(NASA-CR-143835) Avail: NTIS HC $3.75 CSCL 01B

An assessment of the frequency and severity of carburetor/induction icing in general-aviation accidents was performed. The available literature and accident data from the National Transportation Safety Board were collected. A computer analysis of the accident data was performed. Between 65 and 90 accidents each year involve carburetor/induction system icing as a probable cause/factor. Under conditions conducive to carburetor/induction icing, between 50 and 70 percent of engine malfunction/failure accidents (exclusive of those due to fuel exhaustion) are due to carburetor/induction system icing. Since the evidence of such icing may not remain long after an accident, it is probable that the frequency of occurrence of such accidents is underestimated; therefore, some extrapolation of the data was conducted. The problem of carburetor/induction system icing is particularly acute for pilots with less than 1000 hours of total flying time. The severity of such accidents is about the same as any accident resulting from a forced landing or precautionary landing. About 144 persons, on the average, are exposed to death and injury each year in accidents involving carburetor/induction icing as a probable cause/factor. Author

N75-19209# Royal Aircraft Establishment, Farnborough (England).
THE STRADA FLIGHT PATH TRACKING SYSTEM
J. P. Marvillet and J. L. Jouzeau Jan. 1975 29 p refs Transl. into ENGLISH from Aeronaut. Astronaut (Paris), v. 35, no. 3, 1972 p 19-29
(RAE-Lib-Trans-1813; BR46822) Avail: NTIS HC $3.75

A summary of the required performance and a general description of the STRADA system is given along with a detailed study of the LIDAR components. The problems related to system reliability and to propagation in the atmospheric medium are solved. The performance and the fields of application of the optimized test facility as regards cost, efficiency, and ease of operation are considered. Author

N75-19210# Air Force Special Weapons Center, Kirtland AFB, N.Mex.
TIEDOWN TESTS FOR AIR TRANSPORT OF THE XM542 SPRINT CONTAINER Final Report, Apr. - May 1974
Grant W. Gray Oct. 1974 25 p ref
(AF Proj. 921C)
(AD-A001844; AFSWC-TR-74-27) Avail: NTIS CSCL 15/5

Aircraft tiedown configurations for transport of the XM542 Sprint container in the C-5A, C-130, and C-141 aircraft were designed and tested by the Air Force Special Weapons Center (AFSWC). The developed tiedown configurations, test procedures, test data, and test observations are presented. GRA

N75-19211# Cincinnati Univ., Ohio.
USERS MANUAL FOR UCIN VEHICLE OCCUPANT CRASH STUDY MODEL, VERSION 2 Technical Report, 1 Jun. - 1 Dec. 1974
Chris E. Passerello, Ronald L. Huston, and Mark W. Harlow 2 Dec. 1974 34 p refs
(Contract N00014-72-A-0027-0002; NR Proj. 122-303)
(AD-A001801; UC-EA-120174-3) Avail: NTIS CSCL 01/2

The manual briefly describes the model and the range of applicability of the program. It provides detailed instructions regarding the card coding of input data. It discusses the

interpretation of the out-put results. A sample listing of input data is also provided. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications*.

N75-19212# EDMAC Associates, Inc., East Rochester, N.Y.
TACAN/DME DIGITAL DATA BROADCAST DESIGN PLAN. VOLUME 5: FLIGHT TEST PROGRAM Final Report
Sep. 1974 33 p
(Contract DOT-FA72WA-3080)
(AD-A001405/0; FAA-RD-74-161-5) Avail: NTIS HC $3.75

The digital data broadcasting design plan implements the system engineering process for the purpose of defining ground/airborne equipment configuration and flight test program. This plan documents an approach to verify the operational significance and technical feasibility of utilizing existing DME and TACAN to provide the function of broadcasting data to aircraft for use in support of area navigation in addition to its normal function. Author

N75-19213# EDMAC Associates, Inc., East Rochester, N.Y.
TACAN/DME DIGITAL DATA BROADCAST DESIGN PLAN. VOLUME 1: OPERATIONAL ANALYSIS Final Report
Sep. 1974 79 p
(Contract DOT-FA72WA-3080)
(AD-A001403/5; FAA-RD-74-161-1) Avail: NTIS HC $4.75

For abstract, see N75-19212.

N75-19214# Mitre Corp., McLean, Va.
MULTI-SITE INTERMITTENT POSITIVE CONTROL ALGORITHMS FOR THE DISCRETE ADDRESS BEACON SYSTEM
A. L. McFarland 30 Sep. 1974 267 p refs
(Contract DOT-FA70WA-2448)
(AD-A001112/2; MTR-6742; FAA-EM-74-4) Avail: NTIS HC $8.50 CSCL 17/7

Complete detailed computer algorithms for implementing Intermittent Positive Control within a multi-site Discrete Address Beacon System network are presented. Author

N75-19215# National Aerospace Lab., Tokyo (Japan).
EXPERIMENTAL STUDY ON A PASSIVE MAGNETIC SUSPENSION SYSTEM WITH AN EIGHT-POLE STATOR FOR FLOATED INERTIAL SENSORS
Minoru Takizawa, Masao Otsuki, and Takao Suzuki Nov. 1974 20 p refs In JAPANESE; ENGLISH summary
(NAL-TR-393) Avail: NTIS HC $3.25

The characteristics of floated gyros and accelerometers for use in inertial navigation systems are analyzed. A passive magnetic suspension system with an eight pole stator to support the output axes of the inertial sensors is described. The test equipment used in measuring the forces of magnetic suspension is explained. It was determined that the measured magnetic suspension stiffness is large enough to support the output axes of the inertial sensors. Author

N75-19216# Lincoln Lab., Mass. Inst. of Tech., Lexington.
PROVISIONAL MESSAGE FORMATS FOR THE DABS/NAS INTERFACE (REVISION 1)
D. Reiner and H. F. Vandevenne 10 Oct. 1974 46 p refs Supersedes FAA-RD-74-63 Revised
(Contracts DOT-FA72WAI-261; F19628-73-C-0002; FAA Proj. 034-241-012)
(FAA-RD-74-63-A; ATC-33-Rev-1; FAA-RD-74-63) Avail: NTIS HC $3.75

Formats for message are defined which are to be transmitted between DABS and NAS facilities (en route or terminal). These messages include one way surveillance reports to NAS and two way communications messages. The latter support data link functions between NAS and DABS equipped aircraft, as well as aiding in the monitoring and control of DABS sensors. Author

N75-19217# Royal Aircraft Establishment, Farnborough (England).
HELICOPTER ROTOR-PRODUCED MODULATION AND AERIAL FIELD DISTRIBUTION IN THE BAND 30 TO 76 MHz
W. W. Langrish and D. P. L. May Jul. 1974 200 p
(RAE-TR-74032; BR42417) Avail: NTIS HC $7.00

A comprehensive investigation into the cause and effect of rotor produced modulation was made in order to assess its consequences in the performance of frequency modulated systems of communication. The investigation included detailed measurements of the polar field patterns of two airborne antennas of a similar type, one mounted above and the other below the helicopter fuselage. The investigation was carried out in connection with a particular communications project, but the results described are applicable to a wide range of airborne systems of future design since the general case can be predicted from the information. Author (ESRO)

N75-19218# Facility Checking Squadron (1866th) (AFSC) Richards-Gebaur AFB, Ohio.
TRACALS EVALUATION REPORT. TACAN STATION EVALUATION REPORT SHAW AFB, SOUTH CAROLINA Report for 1 Apr. - 28 Jun. 1974
Joseph N. Raeth 31 Oct. 1974 68 p
(AD-A002579; Rept-74/66T/17) Avail: NTIS CSCL 17/7

The evaluation report presents data collected and analyzed to define the capabilities and limitations of the Shaw AFB TACAN, AN/GRN-19A, and its associated power systems. The report documents the primary causes of TACAN coverage restrictions, the nearby tree line and power lines. An attempt to improve coverage by varying the tilt on the AN/GRA-121A antenna is discussed. Analysis of evaluation results and recommendations are present. GRA

N75-19219# Michigan Univ., Ann Arbor. Radiation Lab.
DUAL BAND AIRBORNE ANTENNA STUDY Final Report, 30 Jun. 1973 - 28 Feb. 1974
Joseph E. Ferris Oct. 1974 110 p
(Contract DAAB07-73-C-0337)
(AD-A002043; UMICH-012126-1-F; ECOM-73-0337-F) Avail: NTIS CSCL 09/5

The design and fabrication of two antenna systems is described and experimental results are presented. Each includes two antennas, one of which operates in the C band and the other operates at Ku band. Both antennas in the first system are vertically polarized while those in the second system are horizontally polarized. The antenna systems are designed for airborne use and they are interchangeable with respect to the physical mounting arrangements. Extensive data is given on pattern characteristics, on interband isolation, on gain and on the input VSWR. GRA

N75-19220# Naval Air Development Center, Warminster, Pa.
FLIGHT TEST EVALUATION OF SECANT VECAS COLLISION AVOIDANCE SYSTEM Final Report
Michael Raditz, Oscar Shames, James Hinds, and Patrick Finnegan Nov. 1974 262 p refs
(AD-A002281; NADC-74207-60) Avail: NTIS CSCL 17/7

SECANT (Separation and Control of Aircraft using nonsynchronous techniques) is a candidate for a national standard collision avoidance system. The VECAS (Vertical Escape Collision Avoidance System) version was evaluated for ability to communicate accurately and with sufficient distance to provide timely and correct advisories and maneuver commands in simulated high traffic density. GRA

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

N75-19221 Stanford Univ., Calif.
AERODYNAMIC DESIGN OF A ROTOR BLADE FOR MINIMUM NOISE RADIATION Ph.D. Thesis
Yung Hoon Yu 1974 87 p
Avail: Univ. Microfilms Order No. 74-27141

An analysis of the aerodynamic design of a hovering rotor blade for obtaining minimum aerodynamic rotor noise has been carried out. Attention is given only to rotational noise due to pressure fluctuations on blade surfaces. A functional relation between the pressure distribution along the blade span and the radiated noise is developed. From this relation, along with constraint equations concerning given levels of aerodynamic performance such as given total lift and drag, one may deduce, by utilizing the variational method, an optimum shape of the lift distribution. Results are presented to show that the noise field is considerably affected by the shape of the lift distribution along the blade and that noise reduction of about 5 db may be obtained by designing the rotor blade to yield minimum noise. Dissert. Abstr.

N75-19222*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
ACOUSTIC TRANSMISSION THROUGH A FUSELAGE SIDEWALL
J. F. Wilby and T. D. Scharton [1974] 79 p refs
(Contract NAS1-11839)
(NASA-CR-132602; BBN-2742) Avail: NTIS HC $4.75 CSCL 20A

A study was conducted to define an idealized fuselage sidewall structure and to construct a simplified analytical model for determining acoustikal transmission from exterior to interior of the fuselage. The structural model chosen for the study consists of a double wall system connected by line supports. The double wall has curvature in one direction but is assumed to be infinite in extent in the other direction. Diffuse acoustic plane waves are used as a representation of the excitation field. The transmission of acoustical energy through the sidewall is considered in terms of resonant and non-resonant response. The analytical model is used to estimate the noise levels expected in an aircraft with a high lift propulsion system. Author

N75-19223*# Kanner (Leo) Associates, Redwood City, Calif.
PROBLEMS OF DESIGNING PASSENGER AIRCRAFT
V. M. Sheynin and V. I. Kozlovskiy Washington NASA Mar. 1975 306 p refs Transl. into ENGLISH of the book "Problemy proyektirovaniya passazhirskikh samoletov" Moscow, Mashinostroyeniye Press, 1972 308 p
(Contract NASw-2481)
(NASA-TT-F-808) Avail: NTIS HC $9.25 CSCL 01C

Problems of passenger aircraft design, tracing tendencies from the past through the present, and presenting forecasts for the future are examined. Problems are approached primarily from the standpoint of increasing economic effectiveness, with a goal of improving passenger-cargo mixes, operating expenses and thresholds of profitability. The work goes into problems of different configurations with respect to engine placement, advantages of different types of engines, empennage configuration, layout of passenger and cargo space and thrust- and lift-to-weight-ratios. The most attention is paid to standard jet passenger airplanes and air-buses, but Short Takeoff and Landing (STOL) and Vertical Takeoff and Landing (VTOL) airplanes are also discussed with respect to their use in relatively undeveloped areas. Author

N75-19224*# Boeing Commercial Airplane Co., Seattle, Wash.
FUEL CONSERVATION POSSIBILITIES FOR TERMINAL AREA COMPATIBLE AIRCRAFT Final Report
Mar. 1975 234 p refs
(Contract NAS1-12018)
(NASA-CR-132608; D6-22421) Avail: NTIS HC $7.50 CSCL 01C

Design features and operational procedures are identified, which would reduce fuel consumption of future transport aircraft. The fuel-saving potential can be realized during the last decade of this century only if the necessary research and technology programs are implemented in the areas of composite primary structure, airfoil/wing design, and stability augmentation systems. The necessary individual R and T programs are defined. The sensitivity to fuel usage of several design parameters (wing geometry, cruise speed, propulsion) is investigated, and the results applied to a candidate 18, 140-kg (40,000-lb) payload, 5556-km (3000-nmi) transport design. Technical and economic comparisons are made with current commercial aircraft and other advanced designs. Author

N75-19225# Sydney Univ. (Australia). Dept. of Aeronautical Engineering.
SHEAR LAG ANALYSIS OF THICK SKIN AIRCRAFT STRUCTURES
Grant P. Steven Sep. 1974 36 p refs
(ATN-7404) Avail: NTIS HC $3.75

With the increasing thickness of the stiffened skin panels in aircraft structures it is found that the traditional method of diffusion analysis for concentrated loads is inadequate. A closed form theory is developed which allows the skin to take up its direct stress stiffness in a more natural manner rather than lumping it in with the longitudinal stiffeners. The results of this solution are compared with experimental and finite element results and it is found to offer significant improvements both in predicting the diffusion and the maximum shear stress in the skin panel. This latter aspect is of importance when the buckling strength of the skin panel in shear is under consideration. Author

N75-19226*# National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.
LOW-SPEED WIND-TUNNEL TESTS OF A 1/10-SCALE MODEL OF A BLENDED ARROW ADVANCED SUPERSONIC TRANSPORT An Early Domestic Dissemination Report
H. Clyde McLemore and Lysle P. Parlett Mar. 1975 70 p refs
(Proj. FEDD)
(NASA-TM-X-72671) Avail: NASA Industrial Applications Centers only to U.S. Requesters: HC $4.25/MF $2.25 CSCL 01C

Tests were conducted in the Langley full-scale tunnel to determine the low-speed aerodynamic characteristics of a 1/10-scale model of a blended-arrow advanced supersonic transport. Tests were made for the clean configuration and a high-lift configuration with several combinations of leading and trailing-edge flaps deflected for providing improved lift and longitudinal stability in the landing and takeoff modes. The tests were conducted for a range of angles of attack from -6 deg to 30 deg, sideslip angles from -5 deg to 10 deg, and for Reynolds numbers from 6,780,000 to 13,850,000 corresponding to test velocities of 41 knots to 85 knots. Author

N75-19227# Royal Aircraft Establishment, Farnborough (England). Structures Dept.
A COMPARISON OF FLIGHT LOADS COUNTING METHODS AND THEIR EFFECTS ON FATIGUE LIFE ESTIMATES USING DATA FROM CONCORDE
Ann G. Goodwillie London Aeron. Res. Council 1974 66 p refs Supersedes RAE-TR-73200; ARC-35297
(ARC-CP-1304; RAE-TR-73200; ARC-35297) Avail: NTIS HC $4.25; HMSO £1.15; PHI $4.90

Four load-time histories of turbulence encountered by Concorde are analyzed by six different peak-counting and level-crossing counting procedures. The frequency distributions obtained are then used to find fatigue life ratios using the Miner-Palmgren hypothesis of cumulative damage. Results show that those methods which consider every level crossed or every peak encountered give shorter life estimates than those which disregard all minor intermediate load fluctuations. Those which depend upon threshold conditions occupy an intermediate position. Correlation and spectral analyses are also conducted for each flight. Author (ESRO)

N75-19228# General Dynamics/Fort Worth, Tex. Convair Aerospace Div.

ENVIRONMENTAL AND OPERATING REQUIREMENTS FOR FIRE EXTINGUISHING SYSTEMS ON ADVANCED AIRCRAFT Final Report, 25 Jun. 1973 - 25 Jan. 1974

J. D. McClure and R. J. Springer Sep. 1974 161 p refs

(Contract F33615-73-C-2071)

(AD-A001640; JTCG/AS-74-T-002; AFAPL-TR-73-122) Avail: NTIS CSCL 01/3

Fire extinguishing systems for the advanced aircraft to 1980 will be required to operate efficiently over a wider range of environmental conditions than ever before. To determine what these environmental conditions will be for engine nacelles and adjacent compartments, a study was performed using an existing high performance aircraft. Using this aircraft, its operational parameters were extrapolated out to the advanced aircraft environment. This study defines the environment in which the fire extinguishing system will be required to operate, primary and secondary fire zones, ignition sources, combustibles, and fire extinguishing agent requirements. GRA

N75-19229# Naval Aerospace Recovery Facility, El Centro, Calif.

DESIGN, DEVELOPMENT AND QUALIFICATION TESTING OF THE US NAVY NES-21A PARACHUTE ASSEMBLY Final Report

Jon T. Matsuo Jul. 1974 46 p refs

(AD-A001754; NAVAERORECOVFAC-TR-1-74) Avail: NTIS CSCL 06/7

The report covers the design, development, and the U.S. Navy Service Qualification Program conducted on the NES-21A personnel parachute assembly designed for use in ejection seats of U.S. Navy T-33B and QT-33A aircraft. The NES-21A design objective was to provide a retrofitable replacement for the existing NS-3 personnel parachute assembly which would operate with a decreased opening time. This factor would improve aircrew survivability in the low speed, zero altitude operational envelope. This improvement was accomplished principally by the incorporation of a 40-inch diameter internal pilot chute and main canopy PDVL (Pull Down Vent Lines). The NES-21A parachute assembly will perform satisfactorily as presently designed at 90 KTAS (Knots True Airspeed) and above, for ground level and higher altitude ejections. GRA

N75-19230# Army Aviation Systems Command, St. Louis, Mo.

MAJOR ITEM SPECIAL STUDY (MISS), UH-1C TAIL ROTOR BLADE Final Report, Jan. 1964 - Dec. 1973

Nov. 1974 22 p

(AD-A001714; USAAVSCOM-TR-74-47) Avail: NTIS CSCL 01/3

Major Item Special Study (MISS) reports are performed on DA Form 2410 reportable components. These are time change items and certain condition change items selected because of high cost or need for intensive management. Basically, the MISS reports are concerned with analyzing reported removal data presented in the Major Item Removal Frequency (MIRF) report. The failure modes reported for each removal are examined and grouped into categories which are intended to clarify the intent of the data reporting. From this data, removal distribution can be plotted and an MTR (mean time to removal) can be calculated. The MISS reports then investigate possible cost savings based on total elimination of selected failure modes. These modes are chosen because of the percentage of failures they represent and/or because they appear to be feasible Product Improvement Program (PIP) areas. GRA

N75-19231# Army Aviation Systems Test Activity, Edwards AFB, Calif.

VIBRATION AND TEMPERATURE SURVEY PRODUCTION AH-1G HELICOPTER Final Report, 12 Sep. - 29 Nov. 1973

Emmett J. Laing and Arnold E. Weand, Jr. Mar. 1974 370 p refs

(AD-A002063; USAASTA-70-15-5) Avail: NTIS CSCL 01/3

The objective of the entire environmental test project is to determine quantitative vibration and temperature environment data for all present-day Army helicopters. The objective of the AH-1G environmental survey was to determine the vibration and temperature environment of the AH-1G instruments, avionics, selected components, and the crew stations under all normal operating conditions. GRA

N75-19232# Army Aviation Systems Command, St. Louis, Mo.

CH-47A ASSESSMENT AND COMPARATIVE FLEET EVALUATION: EXECUTIVE SUMMARY REPORT Final Report

Nov. 1974 168 p

(AD-A002057; USAAVSCOM-TR-74-46) Avail: NTIS CSCL 01/3

The purpose of the executive summary is to provide an overview and summarization of the CH-47A assessment. The parameters presented provide management perspective of the CH-47A fleet, in addition to comparative fleet evaluations. Various presentations of reliability and maintainability related parameters give the present system posture of the CH-47A fleet. Model designation series assessment and comparative fleet evaluations are covered in this report. Quality and command program assessments and the command statistics and problem summary are the other reports which make up the total executive summary for the CH-47A. GRA

N75-19233# Naval Air Development Center, Warminster, Pa. Administration and Technical Services Dept.

VIBRATION ENERGY SUMMATIONS IN RESPONSE DOMAIN FOR VISCOUS DAMPED ELASTIC SYSTEMS WITH SINUSOIDAL EXCITATION

J. N. Tait 31 Oct. 1974 121 p

(WF53532404)

(AD-A001690; NADC-73111-81) Avail: NTIS CSCL 01/3

This report presents the development of the response energy summation analysis for a rigidly-connected viscous damped elastic structure model, when subjected to all controlled patterns of sinusoidal vibration excitation. The results are illustrated by fifty-two curve families generated by a computer plotting program. GRA

N75-19234# California Univ., Los Angeles. Dept. of System Sciences.

AN AIRCRAFT APPLICATION OF SYSTEM IDENTIFICATION IN THE PRESENCE OF STATE NOISE

Kenneth W. Iliff 1974 16 p refs Presented at NATO Advan. Study Inst., New Direc. in Signal Process. in Commun. and Control, Darlington, England, 5-17 Aug. 1974

(Grant AF-AFOSR-2492-73; AF Proj. 9769)

(AD-A001936; AFOSR-74-1756TR) Avail: NTIS CSCL 01/2

A maximum likelihood estimator for a linear system with state and observation noise is developed to determine unknown aircraft coefficients from flight data in the presence of turbulence (state noise). The formulation of the algorithm is presented briefly. The linear equations for an aircraft in atmospheric turbulence are defined. The effectiveness and accuracy of the technique are assessed by first applying it to simulated flight data, in which the true parameter values are known, then to actual flight data obtained in turbulence. A complete set of aircraft coefficients is obtained as well as an estimate of the turbulence time history. The validity of the estimated state noise and of the estimated coefficients is tested. The feasibility of using the algorithm for defining an adaptive control law to alleviate the effects of turbulence on the aircraft is discussed. GRA

N75-19235# United Aircraft Corp., Stratford, Conn. Sikorsky Aircraft Div.

DESIGN AND FATIGUE TESTING OF INTEGRAL ARMORED SERVO ACTUATOR MODIFIED TRUNNION Final Report

K. Wood and L. Moriarty Oct. 1974 38 p

(Contract DAAJ02-74-C-0013; DA Proj. 1F2-62205-AH-88)

(AD-A002069; SER-64383; USAAMRDL-TR-74-80) Avail: NTIS CSCL 01/3

The program summarized by this report was conducted to design and establish the structural strength of a modified trunnion design for the integral armored servo actuator. The originally designed trunnion was found to have a fatigue strength below the mean strength level of comparable CH-54B parts as reported in USAAMRDL Technical Report 73-25. The design analysis and fatigue test data show that the modified trunnion is comparable in strength to the mean strength levels of the equivalent components on the production CH-54B helicopter. GRA

N75-19236# Technology, Inc., Dayton, Ohio.
OPERATIONAL USE OF THE UH-1 H HELICOPTERS IN ARCTIC ENVIRONMENT Final Report, 16 Oct. 1972 - 15 Feb. 1974
Raymond B. Johnson, Jr. and Ruth E. Meyers Aug. 1974 465 p refs
(Contract DAAJ02-73-C-0014; DA Proj. 1F1-62208-AH-90)
(AD-A002603; USAAMRDL-TR-74-65) Avail: NTIS CSCL 01/3

For the continued study of Army helicopter operations, a multichannel operational usage data program was conducted on two UH-1H helicopters flying assorted missions in the arctic environment from December 1972 to April 1973. During this period, 88 hours of valid in-flight data were recorded and processed for each of 15 time-related parameters. These parameters were selected to reflect the operational usage of the helicopters. Two zechniques, the Four Mission Segment and the Flight Condition Recognition (FCR) methods, were used in processing and analyzing the data. The ultimate objective was to improve the fatigue analyst's understanding of the operational flight spectrum of U.S. Army helicopters and its effect in defining reliable design criteria for helicopters. GRA

N75-19237# Grumman Aerospace Corp., Bethpage, N.Y.
AN IMPROVED AUTOMATED STRUCTURAL OPTIMIZATION PROGRAM Final Report, 27 Mar. 1973 - 30 Aug. 1974
Walter J. Dyer. Sep. 1974 158 p refs
(Contract F33615-73-C-3086; AF Proj. 1467)
(AD-A002688; AFFDL-TR-74-96) Avail: NTIS CSCL 01/3

This volume presents the results of an effort to modify, expand and improve the usefulness of ASOP (Automated Structural Optimization Program), originally documented in AFFDL TR-70-118. The new version of the program is named ASOP-2. GRA

N75-19238# Army Materiel Command, Alexandria, Va.
ENGINEERING DESIGN HANDBOOK. HELICOPTER ENGINEERING, PART 1: PRELIMINARY DESIGN
30 Aug. 1974 876 p refs
(AD-A002007; AMCP-706-201-Pt-1) Avail: NTIS CSCL 01/3

This handbook discusses the design requirements applicable to Army helicopters for all missions under visual flight rule (VFR) operation, day or night. As such, the scope of this document has been limited to cover the basic aerial vehicles. Design requirements for mission-essential equipment--e.g., weapons, sensors, cargo-handling equipment--are beyond this scope and are not discussed, although the helicopter-integral interface requirements for such equipment are included. The design of power plants, batteries, generators or alternators, and similar components, are also beyond the scope of the handbook. GRA

N75-19239# Advanced Technology Labs., Inc., Westbury, N.Y.
MULTI-SLOT FILM COOLING OF SUPERSONIC AIRCRAFT USING AIR AS A COOLANT Final Technical Report, 4 Jun. 1973 - 3 May 1974
John I. Erdos and John D. Ranlet Jul. 1974 96 p refs
(Contract F33615-73-C-3132; AF Proj. 1366)
(AD-A002673; ALT-TR-202; AFFDL-TR-74-85) Avail: NTIS CSCL 01/3

The study evaluates multi-slot film cooling using air as an active coolant for thermal protection of aircraft surfaces under conditions of steady-state (cruise) operation at supersonic speeds and low to moderate altitudes. In-flight refrigeration of captured atmospheric air using a turbocooler, as described, is assumed to be the only practical means of providing the required continuous supply of cold air. Therefore the properties of the coolant have been described in terms of the vehicle flight conditions and the efficiency of a turbocooler. A computer program has been developed based on the described analysis which determines the slot locations necessary to protect a surface to a specified maximum adiabatic wall temperature at a given set of primary flow conditions. GRA

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N75-19240# Instrument Flight Center, Randolph AFB, Tex.
THREE-INCH VERTICAL TAPE ALTIMETER AND AIRSPEED-MACH INDICATOR EVALUATION Final Report
Edwin G. Webb, Jr. and Gabriel P. Intano Nov. 1974 14 p
(IFC Proj. TE-73-6)
(AD-A001934; IFC-TR-74-6) Avail: NTIS CSCL 01/4

The Research and Development Division of the USAF Instrument Flight Center conducted a pilot factors evaluation of a three-inch altimeter and a three-inch tape airspeed-Mach indicator to determine the utility/suitability of the displays. Approximately 35 hours were flown by nine subject pilots using a T-39 as the test bed for evaluating the displays. From the responses to these questionnaires, it was deemed inadvisable to adopt the altimeter as a primary flight instrument because misinterpretation of altitude remains a problem. However, the tape airspeed-Mach indicator was found acceptable as a primary flight instrument. GRA

N75-19241# Instrument Flight Center, Randolph AFB, Tex.
HAROWE ALTITUDE WARNING SYSTEM EVALUATION Final Report
Edwin G. Webb, Jr. and Gabriel P. Intano Nov. 1974 15 p refs
(AD-A002583; IFC-TR-74-7) Avail: NTIS CSCL 01/2

A pilot factors evaluation of the Harowe altitude warning system was conducted to determine its acceptability for use in Air Force aircraft. The system has the primary function of assisting pilots in attaining and maintaining assigned or desired command altitudes. A secondary function, decision height mode, was incorporated in the AWS to examine the concept of altitude warning during landing approaches. Ten sorties were flown in a North American T-39 Sabreliner. Pilots were selected from the IFC and instrument pilot instructor school student population. The normal mode of operation was found acceptable for aiding pilots in leveling at and maintaining desired altitudes. The accuracy of the normal mode was acceptable and with further development of the decision height mode, the Harowe system would be acceptable for installation in Air Force aircraft. GRA

N75-19128* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A STUDY ON AIRCRAFT MAP DISPLAY LOCATION AND ORIENTATION
D. L. Baty, T. E. Wempe, and E. M. Huff *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 9-24 refs (For availability see N75-19126 11-01)
CSCL 01D

N75-19137* Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
A DISPLAY EVALUATION METHODOLOGY APPLIED TO VERTICAL SITUATION DISPLAYS
Sheldon Baron and William H. Levison *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 121-132 refs (For availability see N75-19126 11-01)
(Contract NAS2-6652)
CSCL 01D

N75-19138* McDonnell-Douglas Corp., Long Beach, Calif.
A CONFORMAL HEAD-UP DISPLAY FOR THE VISUAL APPROACH
J. M. Naish *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 133-145 refs (For availability see N75-19126 11-01)
CSCL 01D

N75-19141* Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
IMPROVEMENTS IN PILOT/AIRCRAFT-INTEGRATION BY ADVANCED CONTACT ANALOG DISPLAYS
V. Wilckens *In* MIT Proc. of the 9th Ann. Conf. on Manual

Control 1973 p 175-192 refs (For availability see N75-19126 11-01)
CSCL 01D

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N75-19242 Cincinnati Univ., Ohio.
TRAJECTORIES OF EROSIVE PARTICLES IN RADIAL INFLOW TURBINE Ph.D. Thesis
Wilmer B. Clevenger, Jr. 1974 273 p
Avail: Univ. Microfilms Order No. 74-27146

Similarity parameters which relate the sizes of particles that follow the same trajectory in equivalent hot gas or cold gas turbines are determined. Trajectories in the rotor were studied and it is shown that particles of erosive size show the same trends in their trajectories independently of Reynolds number. The particle motion in two-dimensional free and forced inward flowing vortices were studied. The characteristic length of particles that will achieve orbits is shown to be related to the velocity direction and the radius of the vortex. An analysis is presented in which the particle characteristic length is shown to be related to the velocity direction and radius in the free vortex, and the ratio between the particle velocity and the gas velocity. The trajectories that erosive particles follow in the gas flow fields of a radial inflow turbine are studied and include the trajectories that particles follow in the scroll, in the nozzles, in the vortex between the nozzles and the rotor, and in the rotor passage. Design concepts considered as providing mechanisms that might help to reduce the amount of erosion that occurs in the radial turbine are presented and their effectiveness studied. Dissert. Abstr.

N75-19243*# Avco Lycoming Div., Stratford, Conn.
DEVELOPMENT OF SELF-ACTING SEALS FOR HELICOPTER ENGINES
Peter Lynwander Oct. 1974 72 p refs
(Contract NAS3-16823)
(NASA-CR-134739; LYC-74-55) Avail: NTIS HC $4.25 CSCL 11A

An experimental evaluation of a NASA-designed self-acting face seal for use in advanced gas turbine main shaft positions was conducted. The seal incorporated Rayleigh step pads (self-acting geometry) for lift augmentation. Satisfactory performance of the gas film seal was demonstrated in a 500-hour endurance test at speeds to 183 m/s (600 ft/sec, 54,000 rpm) and air pressure differential of 137 newtons per square centimeter (198.7 psi). Carbon wear was minor. Tests were also conducted with seal seat runout greater than that expected in engine operation and in a severe sand and dust environment. Seal operation was satisfactory in both these detrimental modes of operation. Author

N75-19244*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PRELIMINARY EVALUATION OF TURBOFAN CYCLE PARAMETERS AND ACOUSTICAL SUPPRESSION ON THE NOISE AND DIRECT OPERATING COST OF A COMMERCIAL MACH 0.85 TRANSPORT
J. D. Eisenberg Feb. 1975 48 p refs
(NASA-TM-X-71664; E-8239) Avail: NTIS HC $3.75 CSCL 20A

A study was made of the effects of turbofan cycle parameters and the use of acoustic noise suppression material to quiet 200 passenger, Mach 0.85 trijets having design ranges of 2778, 4630, and 9260 kilometers (1500, 2500, and 5000 n. mi). Aircraft gross weight and direct operating cost, which varied with amount of suppression and cycle selection, are presented as functions of both EPNdB traded and 90 EPNdB contour footprint area. Noise levels 10.9 EPNdB below FAR 36 requirements result in a 5 percent increase in DOC for an aircraft designed for a range of 9260 kilometers (5000 n. mi.). An aircraft designed for a 2778 kilometer (1500 n. mi.) range would have an EPNdB level 14 below FAR 36 for this same economic penalty. In this range of noise level, fan-machinery noise is the principal source. Author

N75-19245*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
METAL MATRIX COMPOSITES FOR AIRCRAFT PROPULSION SYSTEMS
Robert A. Signorelli 1975 24 p refs Presented at Intern. Conf. on Composite Mater., Geneva, 7-11 Apr. 1975 and Boston, 14-18 Apr. 1975
(NASA-TM-X-71685; E-8280) Avail: NTIS HC $3.25 CSCL 21E

Studies of advanced aircraft propulsion systems have indicated that performance gains and operating costs are possible through the application of metal matrix composites. Compressor fan blades and turbine blades have been identified as components with high payoff potential as a result of these studies. This paper will present the current status of development of five candidate materials for such applications. Boron fiber/aluminum, boron fiber/titanium, and silicon carbide fiber/titanium composites are considered for lightweight compressor fan blades. Directionally solidified eutectic superalloy and tungsten wire/superalloy composites are considered for application to turbine blades for use temperatures to 1100 C (2000 F). Author

N75-19246*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INFLUENCE OF MULTITUBE MIXER NOZZLE GEOMETRY ON CTOL-OTW JET NOISE SHIELDING
U. VonGlahn and D. Groesbeck 1975 21 p refs Presented at 89th Meeting of the Acoust. Soc. of Am., Austin, Tex., 8-11 Apr. 1975
(NASA-TM-X-71681; E-8275) Avail: NTIS HC $3.25 CSCL 20A

Acoustic shielding benefits for CTOL over-the-wing (OTW) applications were obtained experimentally with various multitube nozzles using a simple board to represent a wing. Eight nozzles consisting of three to thirteen 2.36-cm diameter tubes were tested. The nozzles included single and double rings of tubes. Shielding surface lengths of 15.0 to 54.4 cm were used with each nozzle. Far-field noise data were obtained at 90 deg from the jet axis and with a nominal jet exhaust velocity of 200 m/sec. The jet noise shielding benefits for the nozzles with double rows of tubes, in terms of sound pressure level spectra, are correlated successfully as a function of an earlier developed parameter for nozzles with a single ring of tubes that includes consideration of the number of tubes and the local peak velocity in the flow field at the trailing edge of the shielding surface. Author

N75-19247*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPARISON OF PARAMETRIC DUCT-BURNING TURBOFAN AND NON-AFTERBURNING TURBOJET ENGINES IN A MACH 2.7 TRANSPORT
John B. Whitlow, Jr. Mar. 1975 73 p refs
(NASA-TM-X-71679; E-8269) Avail: NTIS HC $4.25 CSCL 21E

A parametric study was made of duct-burning turbofan and suppressed dry turbojet engines installed in a supersonic transport. A range of fan pressure ratios was considered for the separate-flow-fan engines. The turbofan engines were studied both with and without jet noise suppressors. Single- as well as dual-stream suppression was considered. Attention was concentrated on designs yielding sideline noises of FAR 36 (108 EPNdB) and below. Trades were made between thrust and wing area for a constant takeoff field length. The turbofans produced lower airplane gross weights than the turbojets at FAR 36 and below. The advantage for the turbofans increased as the sideline noise limit was reduced. Jet noise suppression, especially for the duct stream, was very beneficial for the turbofan engines as long as duct burning was permitted during takeoff. The maximum dry unsuppressed takeoff mode, however, yielded better results at

extremely low noise levels. Noise levels as low as FAR 36-11 EPNdB were obtained with a turbofan in this takeoff mode, but at a considerable gross weight penalty relative to the best FAR 36 results. Author

N75-19248*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
INTERIOR NOISE CONSIDERATIONS FOR POWERED-LIFT STOL AIRCRAFT
C. Kearney Barton Apr. 1975 19 p refs
(NASA-TM-X-72675) Avail: NTIS HC $3.25 CSCL 01C

Powered-jet configuration which are under development for use on STOL aircraft involve impingement of the jet engine exhaust onto wing and flap surfaces. The impinging jet produces higher noise levels at lower frequencies than does the jet alone. These higher levels, together with the close proximity of the engine and flap noise sources to the fuselage sidewall, suggest that the noise levels in these aircraft may be high enough to interfere with passenger comfort. To investigate this possibility, interior noise levels were estimated for both an upper surface blown and an externally blown flap configuration. This paper describes the procedure used to estimate the interior noise levels is described these levels are compared with levels on existing jet aircraft and on ground transportation vehicles. These estimates indicate high levels in the STOL aircraft; therefore, areas of possible improvements in technology for control of STOL interior noise are also discussed. Author

N75-19249# Goodyear Tire and Rubber Co., Akron, Ohio.
INVESTIGATION OF 14.5mm API SELF-SEALING/CRASHWORTHY FUEL TANK MATERIAL Final Report, Jun. 1973 - Jun. 1974
E. J. Koski and H. F. Villemain Sep. 1974 30 p refs
(Contract DAAJ02-73-C-0099)
(AD-A001752; GTR-19-927; USAAMRDL-TR-74-78) Avail: NTIS CSCL 13/4

This final report describes the results of a program for a crashworthy, 14.5mm API tolerant fuel cell construction developed and subjected to qualification testing. GRA

N75-19250# General Motors Corp., Indianapolis, Ind. Detroit Diesel Allison Div.
INVESTIGATION OF AIRCRAFT COMBUSTOR NOISE Final Report, Jun. 1973 - Apr. 1974
W. R. Semrau and D. E. Frye, Jr. Sep. 1974 413 p refs
(Contract DAAJ02-73-C-0088; DA Proj. 1G1-72207-AA-110)
(AD-A001737; DDA-EDR-8225; USAAMRDL-TR-74-73) Avail: NTIS CSCL 21/5

Current combustor design technology depends primarily upon empirical correlation and past experimental experience of the designers. There is a continuing need for knowledge of the combustion process and how the different design and performance parameters are related. The objective of this program was to investigate the feasibility of measuring combustor noise and then relating the noise levels by correlation curves to other pertinent performance parameters, such as combustor efficiency, and mass emissions. GRA

N75-19251# Avco Lycoming Div., Stratford, Conn.
PLT 27 GAS TURBINE ENGINE EXHAUST EMISSION AND NOISE MEASUREMENTS Final Report, 21 May - 31 Dec. 1973
Phillip M. Rubins, Edward Auerbach, and Jochen A. Deman Sep. 1974 111 p refs
(Contract DAAJ02-73-C-0068; DA Proj. 1G1-62204-AA-71)
(AD-A001728; LYC-74-7; USAAMRDL-TR-62204-AA-71) Avail: NTIS CSCL 21/5

The results of the exhaust gas emission analysis show that the exhaust gases have a low content of unburned combustion products, i.e., hydrocarbons and carbon monoxide, down to idle power due to the high combustion efficiency of this engine. The combustion efficiency is 99.5 percent at idle and 99.9 percent above 10 percent of maximum-rated power. The smoke numbers of the PLT 27 engine are extremely low. No visible smoke was produced at any power setting with any of the injector systems tested. The PLT 27 engine meets the exhaust gas emission standards set by the EPA for 1979 for fixed-wing aircraft. GRA

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N75-19252# European Space Research Organization, Paris (France).
DETERMINATION OF AIRCRAFT CHARACTERISTICS FROM FLIGHT TESTS
Nov. 1974 260 p refs Transl. into ENGLISH of "Bestimmung von Flugzeugkenndaten aus Flugversuchen", DGLR, Cologne, DLR-Mitt-73-25, 1973 295 p Proc. of Joint Session of DGLR Specialist Comm. "Flight Characteristics and Flight Test Tech.", Brunswick, 10-12 Oct. 1972
(ESRO-TT-104; DLR-Mitt-73-25) Avail: NTIS HC $8.50; ZLDI, Munich 61.95 DM

Different procedures for the analysis of flight test data in order to obtain stability characteristics are presented. Methods discussed include: time vectors, forced oscillations, analog matching, and regression analysis. Notwithstanding the considerable difficulties in data measurement, the task of evaluating aircraft characteristics from flight data is indispensable for setting up reliable mathematical models to describe the dynamic behavior of the aircraft. For individual titles, see N75-19253 through N75-19266.

N75-19253 European Space Research Organization, Paris (France).
DETERMINATION OF CHARACTERISTICS: INTRODUCTION AND GLOBAL VIEW
P. Hamel *In its* Determination of Aircraft Characteristics from Flight Test (ESRO-TT-104) Nov. 1974 p 1-6 Transl. into ENGLISH of "Bestimmung von Flugzeugkenndaten aus Flugversuchen", DGLR, Cologne, DLR-Mitt-73-25, 1973 p 7-14 (For availability see N75-19252 11-08)

A general description is given of the methods for the determination of aircraft characteristics and associated problems. Different methods are briefly discussed. They include mathematical models, ground testing installations, instrumentation (sensors), flight test methods, and data evaluation. ESRO

N75-19254 European Space Research Organization, Paris (France).
COMPARISON OF EVALUATION PROCEDURES FOR THE DETERMINATION OF FLIGHT-MECHANICAL COEFFICIENTS AND DERIVATIVES FROM FLIGHT TESTS
H. Friedrich *In its* Determination of Aircraft Characteristics from Flight Test (ESRO-TT-104) Nov. 1974 p 7-16 refs Transl. into ENGLISH of "Bestimmung von Flugzeugkenndaten aus Flugversuchen", DGLR, Cologne, DLR-Mitt-73-25, 1973 p 15-28 (For availability see N75-19252 11-08)

The analysis of data from flight tests of a Fiat G.91-T3 aircraft is discussed. A survey is presented of possible evaluation methods of which five methods were selected. A description is given of the procedures adopted. ESRO

N75-19255 European Space Research Organization, Paris (France).
MANUAL EVALUATION OF SPECIAL FLYING MANEUVERS FOR THE DETERMINATION OF FLIGHT-MECHANICAL COEFFICIENTS AND DERIVATIVES FROM FLIGHT TESTS
U. VonMeier *In its* Determination of Aircraft Characteristics from Flight Test (ESRO-TT-104) Nov. 1974 p 17-32 refs Transl. into ENGLISH of "Bestimmung von Flugzeugkenndaten aus Flugversuchen", DGLR, Cologne, DLR-Mitt-73-25, 1973 p 29-50 (For availability see N75-19252 11-08)

Manual data analysis procedures of G.91-T3 aerodynamic characteristics are described. The aircraft was fitted with equipment designed to measure the derivatives in non-steady flight, consisting of measurement units, a recording system and a data conversion unit. The measurement of the dynamic longitudinal stability is discussed. The method used for evaluation of the lateral motion is described. A simplified evaluation of special flying maneuvers is considered. ESRO

N75-19256 European Space Research Organization, Paris (France).

EVALUATION BY MEANS OF THE TIME VECTOR METHOD

H. Wuennenberg *In its* Determination of Aircraft Characteristics from Flight Test (ESRO-TT-104) Nov. 1974 p 33-57 refs Transl. into ENGLISH of "Bestimmung von Flugzeugkenndaten aus Flugversuchen", DGLR, Cologne, DLR-Mitt-73-25, 1973 p 51-80 (For availability see N75-19252 11-08)

The application of the time vector method for the determination of derivatives from flight tests is discussed. It is shown that this method is very suitable for checking the amplitudes and the phases of measurement signals. The method however has limitations as regards the actual evaluation, since many different solution combinations become possible in the absence of unambiguous reference values. The evaluation of the Dutch roll motion highlights the latter. ESRO

N75-19257 European Space Research Organization, Paris (France).

DETERMINATION OF AERODYNAMIC DERIVATIVES OF THE FIAT G-91 T3 AIRCRAFT FROM FLIGHT TESTS BY MEANS OF MANUAL ANALOG MODEL MATCHING

A. Pietrass *In its* Determination of Aircraft Characteristics from Flight Test (ESRO-TT-104) Nov. 1974 p 58-87 refs Transl. into ENGLISH of "Bestimmung von Flugzeugkenndaten aus Flugversuchen", DGLR, Cologne, DLR-Mitt-73-25, 1973 p 81-110 (For availability see N75-19252 11-08)

Aerodynamic derivatives of the FIAT G-91 T3 aircraft were determined by evaluating the results of flight tests in accordance with the method of the manual variation of the model parameters in the analog computer (analog model matching). The test flights were carried out at an altitude of 20,000 ft and at Mach numbers of 0.4 and 0.8. The results often deviate significantly from the values deduced from the manufacturer's data, this being particularly true as regards the lateral motion. Author (ESRO)

N75-19258 European Space Research Organization, Paris (France).

EVALUATION OF FLIGHT TEST OF THE FIAT G-91 T3 BY MEANS OF THE METHOD OF FORCED OSCILLATIONS

H. J. Munser *In its* Determination of Aircraft Characteristics from Flight Test (ESRO-TT-104) Nov. 1974 p 88-106 ref Transl. into ENGLISH of "Bestimmung von Flugzeugkenndaten aus Flugversuchen", DGLR, Cologne, DLR-Mitt-73-25, 1973 p 111-132 (For availability see N75-19252 11-08)

The G.91-T3 aircraft was actuated to perform harmonic oscillations, in order to determine its stability characteristics. Sets of equations were derived in order to calculate the stability derivatives for each degree of freedom. The method was tested with simulated, and flight test data. It is concluded that the method of forced oscillations is not particularly suitable for fully automatic evaluation. ESRO

N75-19259 European Space Research Organization, Paris (France).

EVALUATION OF FLIGHT TESTS OF THE FIAT G-91 T3 BY MEANS OF REGRESSION ANALYSIS

H. Friedrich *In its* Determination of Aircraft Characteristics from Flight Test (ESRO-TT-104) Nov. 1974 p 107-137 ref Transl. into ENGLISH of "Bestimmung von Flugzeugkenndaten aus Flugversuchen", DGLR, Cologne, DLR-Mitt-73-25, 1973 p 133-168 (For availability see N75-19252 11-08)

The experiences made in applying regression analysis are summarized. Regression analysis is a refined mathematical program that undertakes the breakdown of the aerodynamic coefficients into the components due to the individual variables and at the same time eliminates any stochastic errors. All the derivations can be obtained on one run. Attempts at practical evaluation are described. ESRO

N75-19260 European Space Research Organization, Paris (France).

A SAAB-SCANIA DEVELOPED METHOD FOR OBTAINING STABILITY DERIVATIVES FROM FLIGHT TESTS

G. Niss *In its* Determination of Aircraft Characteristics from Flight Test (ESRO-TT-104) Nov. 1974 p 138-153 ref Transl. into ENGLISH of "Bestimmunng von Flugzeugkenndaten aus Flugversuchen", DGLR, Cologne, DLR-Mitt-73-25, 1973 p 169-184 (For availability see N75-19252 11-08)

The method used is an assembly of procedures from other known methods. Parameters needed for the analyses are available from onboard analog tape recordings. The tapes are converted to digital computer tapes at the same time as all the scaling and other instructions are fed into the process. The time intervals to be processed are also defined. After corrections have been made the process continues with calculation of forces and moments. Digital simulation in 6 degrees of freedom is used as a validity check. ESRO

N75-19261 European Space Research Organization, Paris (France).

CHARACTERISTICS OF THE AJ 37 AIRCRAFT: COMPARISON OF THE RESULTS OF WIND TUNNEL AND FLIGHT TESTS

G. Straeng *In its* Determination of Aircraft Characteristics from Flight Test (ESRO-TT-104) Nov. 1974 p 154-170 Transl. into ENGLISH of "Bestimmung von Flugzeugkenndaten aus Flugversuchen", DGLR, Cologne, DLR-Mitt-73-25, 1973 p 185-202 (For availability see N75-19252 11-08)

Comparison of aerodynamic coefficients obtained from wind tunnel measurements with results of flight tests is possible only in individual cases, since wind tunnel models have a rigidity or elasticity not corresponding to that of the aircraft. Elasticity correction must, therefore, be carried out. The method used for the AJ 37 aircraft is briefly described. A satisfactory agreement was found between coefficients obtained from flight tests and the ones calculated from corrected wind tunnel tests. ESRO

N75-19262 European Space Research Organization, Paris (France).

SOME ASPECTS OF PERFORMANCE MEASUREMENTS IN NONSTEADY FLIGHT

J. A. Mulder *In its* Determination of Aircraft Characteristics from Flight Test (ESRO-TT-104) Nov. 1974 p 171-190 refs Transl. into ENGLISH of "Bestimmung von Flugzeugkenndaten aus Flugversuchen", DGLR, Cologne, DLR-Mitt-73-25, 1973 p 203-222 (For availability see N75-19252 11-08)

The principle of determining the angle of attack and the rate of climb from measurements in nonsteady flight is described. It is shown that small zero-shifts of the inertial transducers would result in unacceptable errors in the calculated angle of attack and in rate of climb. A flight path reconstruction technique yielding estimates of the zero-shifts turns out to be the keypoint of the flight test technique presented. ESRO

N75-19263 European Space Research Organization, Paris (France).

DETERMINATION OF THE PARAMETERS OF A SYSTEM OF EQUATIONS OF MOTION FROM FLIGHT TEST DATA

H. U. Schaeufele *In its* Determination of Aircraft Characteristics from Flight Test (ESRO-TT-104) Nov. 1974 p 191-212 refs Transl. into ENGLISH of "Bestimmung von Flugzeugkenndaten aus Flugversuchen", DGLR, Cologne, DLR-Mitt-73-25, 1973 p 223-248 (For availability see N75-19252 11-08)

The method of least squares can be used for the determination of the parameters of a system of differential equations. It is shown that good results can be obtained with this method. A subsequent iteration aims at improving the parameters calculated with the help of the method of least squares. A new procedure for the iterative determination of the parameters of a system of differential equations is described; the new method is simpler than other procedures of this type known at present.

Author (ESRO)

N75-19264 European Space Research Organization, Paris (France).

PARAMETER ESTIMATION FROM FLIGHT TEST DATA BY MEANS OF STATISTICAL METHODS IN THE FREQUENCY DOMAIN

M. Marchand *In its* Determination of Aircraft Characteristics from Flight Test (ESRO-TT-104) Nov. 1974 p 213-223 refs Transl. into ENGLISH of "Bestimmung von Flugzeugkenndaten aus Flugversuchen", DGLR, Cologne, DLR-Mitt-73-25, 1973 p 249-260 (For availability see N75-19252 11-08)

Two methods for the determination of the parameters of

linear multivariable systems from frequency response data are presented. The first method yields a balance of frequency response curves in the form of rational functions of i (omega), and further parameters (such as the location of poles and the zeros of transfer functions) can then be determined from these functions. The second method yields the coefficients of the differential equation system, from which the flight-mechanical parameters (coefficients and derivatives) can then be determined. Some examples of applications in the field of flight mechanics are given.
Author (ESRO)

N75-19265 European Space Research Organization, Paris (France).
DETERMINATION OF DERIVATIVES BY A MODEL WITH AUTOMATIC PARAMETER
R. Koehler *In its* Determination of Aircraft Characteristics from Flight Test (ESRO-TT-104) Nov. 1974 p 224-239 Transl. into ENGLISH of "Bestimmung von Flugzeugkenndaten aus Flugversuchen", DGLR, Cologne, DLR-Mitt-73-25, 1973 p 261-278 (For availability see N75-19252 11-08)

An analog circuit that continuously adapts the model parameters to the unknown system characteristic values is used to determine the derivatives of an aircraft from flight data. The results of an evaluation with a linear and a nonlinear model are discussed. Author (ESRO)

N75-19266 European Space Research Organization, Paris (France).
SELECTED EXAMPLES OF THE EVALUATION OF VAK 191 B FLIGHT TESTS
R. Burdorf *In its* Determination of Aircraft Characteristics from Flight Tests (ESRO-TT-104) Nov. 1974 p 240-254 Transl. into ENGLISH of "Bestimmung von Flugzeugkenndaten aus Flugversuchen", DGLR, Cologne, DLR-Mitt-73-25, 1973 p 279 (For availability see N75-19252 11-08)

A method is described enabling determination of the roll control characteristic of the VAK 191 B aircraft from measured values obtained during hovering flight. The basic magnitude is the rotational velocity as measured by the rate gyro, its variations in time approximated by means of a polynomial that is then differentiated. The effect of the discretization of the measured values as a result of data transmission is investigated. The rotational acceleration obtained consists of the desired control acceleration and aerodynamic disturbances. The disturbances occurring during these flights were estimated with a simulation program for the VAK 191 B aircraft, thereby determining the control characteristic. ESRO

N75-19267# Royal Aircraft Establishment, Bedford (England). Aerodynamics Dept.
DETERMINATION OF THE RUDDER POWER AND DIRECTIONAL STABILITY OF THE FAIREY DELTA 2 AIRCRAFT USING A WINGTIP PARACHUTE
G. Ingle London Aeron. Res. Council 1974 34 p refs Supersedes RAE-TR-73025; ARC-34852
(ARC-CP-1298; RAE-TR-73025; ARC-34852) Avail: NTIS HC $3.75; HMSO 65p; PHI $2.75

The wingtip parachute technique was used to extract a rudder power derivative for the Fairey Delta 2 research aircraft. The flight tests revealed that the derivative has a considerably smaller value than tunnel tests suggested, and it is believed that this is due to the aeroelasticity of the fin and rudder, and possibly to unrepresentative flow over the rear of the wind-tunnel model. Once the derivative was obtained, a directional stability derivative was derived on the assumption that the rudder power derivative was small. The values of the directional stability derivative obtained by this technique agree well with those from other flight tests and reasonably well with tunnel test results. Author (ESRO)

N75-19268# Army Foreign Science and Technology Center, Charlottesville, Va.
HELICOPTER FLIGHT REGIMES
G. Samoilov 17 Aug. 1974 18 p Transl. into ENGLISH from Aviatsiya i Kosmonavtika (USSR), no. 11, 1972 p 20-21, 26-27
(AD-A001220; FSTC-HT-23-299-74) Avail: NTIS CSCL 01/2

The article deals with steady regimes of helicopter flight. The first and the second regimes of a steady helicopter flight are described. Horizontal flights as well as other rectilinear states such as climbs and engine descent are studied. A significant part of the article is devoted to steady turns and some unsteady flight regimes such as acceleration and slowing down. GRA

N75-19269# Princeton Univ., N.J. Instrumentation and Control Lab.
FLIGHT PATH CONTROL AND PERFORMANCE ANALYSIS, PHASES 1 AND 2. INTEGRATED DISPLAY, PHASE 3 Final Report
G. J. Born, T. A. Dukes, E. J. Durbin, and P. B. Sun Jul. 1974 114 p refs
(Contract DAAB07-72-C-0161)
(AD-A002014; ECOM-0161-72-F) Avail: NTIS CSCL 01/3

The question of symbology superimposed on an image display for low level flying is explored. Three formats of symbology superimposed on a TV image display have been developed, based on the ITED (Integrated Trajectory Error Display). A helicopter performance and control model developed earlier is reviewed. A gas turbine engine model is developed, first for the ideal turbine, and then modified for a practical engine mounted in a helicopter. Three modifications of the S-ITED (Superimposed Integrated Trajectory Error Display) are described. These changes have been made to improve the integration of the symbology with the image display. The modified display is described in the form of a briefing for simulator test subjects. GRA

N75-19130* Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).
DYNAMIC READING OF ANALOG AND DIGITAL DISPLAYS: A COMPARATIVE STUDY
E. Schubert *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 43-48 refs (For availability see N75-19126 11-01)
CSCL 01C

N75-19131* Ohio State Univ., Columbus. Dept. of Aviation.
A TACTUAL PILOT AID FOR THE APPROACH-AND-LANDING TASK: INFLIGHT STUDIES
Richard D. Gilson and Robert E. Fenton *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 49-53 refs (For availability see N75-19126 11-01)
CSCL 01C

N75-19132* Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
EVALUATION OF TACTUAL DISPLAYS FOR FLIGHT CONTROL
William H. Levison, Robert B. Tanner, and Thomas J. Triggs *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 55-71 refs Sponsored in part by ARPA (For availability see N75-19126 11-01)
(Contract N00014-73-C-0031)
CSCL 01C

N75-19133* Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
PITCH PAPER PILOT REVISITED
John D. Arnold, Robert B. Johnson, and James D. Dillow *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 75-81 refs (For availability see N75-19126 11-01)
CSCL 01C

N75-19134* Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
ROLL PAPER PILOT
Flynoy R. Naylor, James D. Dillow, and Russell A. Hannen *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 83-92 refs (For availability see N75-19126 11-01)
CSCL 01C

N75-19135* Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
PAPER PILOT PONDERS SUPERSONIC TRANSPORTS
John R. Stone *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 95-101 refs (For availability see N75-19126 11-01)
CSCL 01C

N75-19140* Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
A MODEL BASED TECHNIQUE FOR THE DESIGN OF FLIGHT DIRECTORS
William H. Levison *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 163-172 refs (For availability see N75-19126 11-01)
(Contract NAS2-6652)
CSCL 01C

N75-19147* Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).
OPTIMIZATION OF CONTROL GAIN BY OPERATOR ADJUSTMENT
W. Kruse and G. Rothbauer *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 259-263 refs (For availability see N75-19126 11-01)
CSCL 05H

N75-19162* Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
ANALYSIS OF RESPONSE TO WIND-SHEARS USING THE OPTIMAL CONTROL MODEL OF THE HUMAN OPERATOR
Sheldon Baron *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 419-428 refs (For availability see N75-19126 11-01)
(Contract NAS2-6652)
CSCL 01C

N75-19164* Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
ON MODELING PERFORMANCE OF OPEN-LOOP MECHANISMS
T. B. Sheridan *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 443-449 refs (For availability see N75-19126 11-01)
CSCL 01C

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

N75-19270# National Aviation Facilities Experimental Center, Atlantic City, N.J.
FLIGHT TEST OF DIAMOND AND OTHER PROPORTIONED RUNWAY PAINT MARKINGS FOR GLIDE SLOPE GUIDANCE Final Report, Dec. 1972 - Jun. 1974
Guy S. Brown, Donald Eldredge, and Richard L. Sulzer Nov. 1974 29 p refs
(FAA Proj. 071-312-050)
(AD-A001038/9; FAA-RD-74-166; FAA-NA-74-34) Avail: NTIS HC $3.75

The glide slope guidance value of three patterns of specially proportioned paint markings on the approach end of a small airport runway was evaluated in a flight test which included approaches using a red/white VASI and approaches using only normal visual cues. Private and professional pilots were instructed to approach on a glide slope such that the special paint markings, a diamond, an ellipse, or a pair of rectangles, appeared square or of equal dimensions in length and width. Results indicated that approaches made with the specially proportioned paint markings were similar to approaches made using only normal cues. While flight performance appeared to be unaffected by providing any of the special paint markings, approaches made using the red/white VASI were less variable. It is concluded that there is no evidence of improved performance supporting the previous claims that squareness judgments of runway paint markings provide significant aid in glide slope control. Additional tests conducted with diamond marks designed to provide a square image from 3 deg to 5 deg produced results indicating large errors in the undershoot direction. Author

N75-19271*# Calspan Corp., Buffalo, N.Y.
A STUDY FOR ACTIVE CONTROL RESEARCH AND VALIDATION USING THE TOTAL IN-FLIGHT SIMULATOR (TIFS) AIRCRAFT
Robert T. N. Chen, Hamilton Daughaday, Dominick Andrisani, II, Robert D. Till, and Norman C. Weingarten Apr. 1975 164 p refs
(Contract NAS1-13329)
(NASA-CR-132614; AK-5560-F-1) Avail: NTIS HC $6.25 CSCL 14B

The results of a feasibility study and preliminary design for active control research and validation using the Total In-Flight Simulator (TIFS) aircraft are documented. Active control functions which can be demonstrated on the TIFS aircraft and the cost of preparing, equipping, and operating the TIFS aircraft for active control technology development are determined. It is shown that the TIFS aircraft is as a suitable test bed for inflight research and validation of many ACT concepts. Author

N75-19272# Aeronautical Research Labs., Melbourne (Australia).
THE ARL FRACTURE TOUGHNESS TESTING FACILITY
B. E. Anderson, R. Ellis, and N. E. Ryan Apr. 1974 28 p refs
(ARL/SM-Note-405/Met-Note-105) Avail: NTIS HC $3.75

Techniques employed in all phases of fracture toughness determination are described: selection of specimen type, fatigue pre-cracking, static testing and evaluation of data. The results of a series of tests on compact tension and bend specimens of medium and ultra-high strength steels are included to provide verification of the procedures employed. Author

N75-19273*# Kanner (Leo) Associates, Redwood City, Calif.
STUDIES RELATIVE TO THE INDUCTION PRESSURIZED TRANSONIC WIND TUNNEL. B: START-UP: SETTING-UP TIME
C. Quemard, A. Mignosi, and A. Seraudie Washington NASA Mar. 1975 48 p refs Transl. into ENGLISH of "Etudes Relatives a une Soufflerie Transsonique Pressurisee a Induction. B: Mise en Marche; Temps d'Etablissement", ONERA report TN-6/5006, Jul. 1974 p 1-40
(Contract NASw-2481)
(NASA-TT-F-16184; ONERA-TN-6/5006) Avail: NTIS HC $3.75 CSCL 14B

The problem of starting an induction wind tunnel with return circuit is discussed. The basic equations governing start-up are given, and the principal experiments conducted with the T prime sub 2 wind tunnel with peripheral injection are shown. Finally the results of experiments and of the computation are discussed and a comparison of experiment and computation is made. Author

N75-19274# Royal Aircraft Establishment, Farnborough (England).
REAL-TIME SIMULATION OF JET ENGINES WITH A DIGITAL COMPUTER(1), FABRICATION AND CHARACTERISTICS OF THE SIMULATOR
K. Nishio, N. Sugiyama, T. Koshinuma, T. Hashimoto, T. Ohata, and H. Ichikawa 18 Sep. 1974 53 p refs Transl. into ENGLISH from Japanese report
(RAE-Lib-Trans-1768; BR46783; NAL-TR-283(1972)) Avail: NTIS HC $4.25

The fabrication and performances of a real-time jet engine simulator using a digital computer are reported along with simulation test results. Actual engine test data for the lift jet engine JR-100H are included. Author

N75-19275# Watervliet Arsenal, N.Y.
A NEW DEVICE FOR GENERATING PRESSURES UP TO 400 KILOBARS
D. P. Kendall, P. V. Dembowski, and T. E. Davidson Oct. 1974 19 p refs
(DA Proj. 1T1-61102-B-11A)
(AD-A001671; WVT-TR-74045) Avail: NTIS CSCL 14/2

The paper describes a unique device for generating ultra-high pressures in the order of 400 kilobars (40 GPa). This is a variable lateral support, Bridgeman Anvil device which uses the principle of a segmented cylinder to provide the lateral support and to apply the force to the anvils. The system has been

calibrated to 212 kilobars using resistivity measurements to detect the known phase transitions in bismuth, iron, lead and 10 and 20 percent cobalt alloys of iron. A pressure of 400 kilobars, based on a linear extrapolation of this calibration, has been attained. GRA

N75-19276# Radio Corp. of America, Moorestown, N.J. Missile and Surface Radar Div.
WSMR MULTIPATH AND MULTIPLE TARGET FACILITY Final Report
Don N. Thomson, Samuel M. Sherman, and Robert W. Wagner Sep. 1974 118 p refs
(Contract DAAD07-73-C-023423)
(AD-A001744) Avail: NTIS CSCL 14/2

The report covers an experimental program designed to evaluate the use of the Complex Indicated Angle technique for measuring the elevation angle of targets in a multipath environment. The test radar was an AN/FPS-16 at WSMR. Data taken with a simulated target were encouraging. Tests with aircraft targets, however, produced rapidly fluctuating data from which the elevation angle could not be deduced. This flight test data does not agree with theory nor with previously obtained flight data. The reason for the fluctuations was not determined but possible causes are discussed. GRA

N75-19277# Naval Ordnance Lab., White Oak, Md.
NOL MACH 18 HYPERVELOCITY RESEARCH TUNNEL
Ray H. Cornett and Alton G. Keel, Jr. 29 Aug. 1974 42 p refs
(AD-A001709; NOLTR-TR-74-158) Avail: NTIS CSCL 14/2

The aerodynamic capabilities and physical characteristics of the Naval Ordnance Laboratory's Mach number 18 Hypervelocity Research Tunnel are described. This tunnel is a high-pressure, blowdown-type facility that uses nitrogen as the working gas. The facility provides a maximum test section Reynolds number of 12 million per meter (0.7 million per foot) at the maximum stagnation pressure of 700 atmospheres and a supply temperature of 2100 Kelvin. A forced-convection electric heater with a graphite heater element is used to achieve the required flow temperatures. The axisymmetric, contoured nozzle is 3.96 meters long with an exit diameter of 0.61 meters. Flow times are from one to four minutes. GRA

N75-19278# University of Southern Calif., Los Angeles. Behavioral Technology Labs.
FIELD EVALUATION OF MODEL 2 OF THE COMPUTER-BASED, INDIVIDUAL TRAINER FOR THE RADAR INTERCEPT OFFICER Final Report, 1 Jan. - 31 Dec. 1974
Joseph W. Rigney, D. Kirk Morrison, Louis A. Williams, and Douglas M. Towne Jul. 1974 58 p refs
(Contract N61339-73-C-0065; ARPA Order 2310)
(AD-A002705; NAVTRAEQUIPCEN-73-C-0065-2) Avail: NTIS CSCL 05/9

Model II of the basic skills intercept trainer for Radar Intercept Officers was evaluated in a school environment. Model II incorporated different instructional sequencing logic, additional weaponry capability, and additional graphic features from Model I (developed under a previous project). These added features were designed to assist the student in understanding the intercept geometry and in learning to use the B-scan display. One (N-31) of two random groups practiced on a trainer with these additional graphics, the other group (N-29) used a version of the trainer without these features. The group using the enhanced trainer took longer and required more problems to satisfy the trials-to-criterion logic used in the practice session. All students expressed predominantly favorable attitudes toward the trainer. Results are discussed, and recommendations are offered. GRA

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N75-19279*# Rockwell International Corp., Downey, Calif. Space Div.
SPACELAB USER IMPLEMENTATION ASSESSMENT STUDY. VOLUME 1: CONCEPT DEVELOPMENT AND EVALUATION Final Report
Feb. 1975 162 p
(Contract NAS1-12933)
(NASA-CR-132580; SD-74-SA-0156-Vol-1) Avail: NTIS HC $6.25 CSCL 22A

The total matrix of alternate Spacelab processing concepts and the rejection rationale utilized to reduce the matrix of 243 alternates to the final candidate processing concepts are developed. The work breakdown structure used for the systematic estimation and compilation of integration and checkout resources is presented along with descriptors of each element. Program models are provided of the space transportation system, the Spacelab, the orbiter, and the ATL that were used as the basis for the study trades, analyses, and optimizations. Resource requirements for all processing concepts are summarized along with the optimizations of the processing concepts. Concept evaluations including flight-rate sensitivities of the GSE, facilities, Spacelab hardware elements, and personnel are delineated. An analysis is presented of the applicability of the candidate concepts to potential spacelab users. The impact of the use of the western test range as an orbiter/spacelab launch site on the candidate processing concepts is evaluated. An assessment of the geographical co-location of experiment, Spacelab, and orbiter-cargo integration is included. Ownership options of the support module/system igloo are discussed. Author

N75-19280*# Rockwell International Corp., Downey, Calif. Space Div.
SPACELAB USER IMPLEMENTATION ASSESSMENT STUDY. VOLUME 2: CONCEPT OPTIMIZATION Final Report
Feb. 1975 146 p
(Contract NAS1-12933)
(NASA-CR-132581; SD-74-SA-0156-Vol-2) Avail: NTIS HC $5.75 CSCL 22A

The integration and checkout activities of Spacelab payloads consist of two major sets of tasks: support functions, and test and operations. The support functions are definitized and the optimized approach for the accomplishment of these functions are delineated. Comparable data are presented for test and operations activities. Author

N75-19281*# Rockwell International Corp., Downey, Calif. Space Div.
SPACELAB USER IMPLEMENTATION ASSESSMENT STUDY. VOLUME 3: RESOURCE REQUIREMENTS DEVELOPMENT Final Report
Feb. 1975 224 p
(Contract NAS1-12933)
(NASA-CR-132582; SD-74-SA-0156-Vol-3) Avail: NTIS HC $7.25 CSCL 22A

The resources requirements for the integration and checkout of spacelab payloads are presented in three categories: mission-unique, sustaining, and non-recurring. The requirements are identified by concept and by center. Cost estimates for the resource requirements are also presented. Author

N75-19282*# Rockwell International Corp., Downey, Calif. Space Div.
SPACELAB USER IMPLEMENTATION ASSESSMENT STUDY. VOLUME 4: SUIAS APPENDIXES Final Report
Feb. 1975 400 p
(Contract NAS1-12933)
(NASA-CR-132583; SD-74-SA-0156-Vol-4) Avail: NTIS HC $10.25 CSCL 22A

The capital investment for the integration and checkout of Spacelab payloads is assessed. Detailed data pertaining to this assessment and a computer cost model utilized in the compilation of programmatic resource requirements are delineated. Author

N75-19283*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APOLLO EXPERIENCE REPORT: GROUND-SUPPORT EQUIPMENT
James S. Cooper Washington Apr. 1975 26 p ref
(NASA-TN-D-7918; JSC-S-415) Avail: NTIS HC $3.75 CSCL 22A

The experience gained in management of the ground-support-equipment and site-readiness activity for the Apollo Program is summarized. The design of equipment and facilities are examined as well as some operational aspects. The organization for ensuring site readiness and the maintenance of ground-support equipment are discussed. Recommendations for use in future programs are given in the areas of design considerations, cleanliness requirements, periodic evaluation of changing requirements, maintenance and overhaul, special test equipment, site-activation schedule coordination, and schematics for ground-support equipment.
Author

N75-19284*# National Aeronautics and Space Administration, Washington, D.C.
SPACE SHUTTLE: PROGRAM OVERVIEW
Jun. 1974 24 p
(NASA-TM-X-70412) Avail: NTIS HC $3.25 CSCL 22A

The primary design and operations goal for the space shuttle program to provide low-cost transportation to and from earth orbits for the purpose of conducting investigations in space via spacelabs and free flying or automated satellites is reviewed. The space shuttle system and mission profile is described along with the space shuttle orbiter system and payloads accommodations, attachments, and handling. The implications the space shuttle program has for international cooperation in space are mentioned.
J.M.S.

N75-19285# European Space Research Organization, Paris (France).
PROCESSING AND MANUFACTURING IN SPACE
Bruce T. Battrick, ed. and T. Duc Nguyen, ed. Jul. 1974 358 p refs Proc. of a Symp. held at Frascati, Italy, 25-27 Mar. 1974
(ESRO-SP-101) Avail: NTIS HC $10.00

The present state of knowledge of space environment influence on the handling and behavior of materials, and on the properties of materials processed in this environment, is reported. Reviews cover the fields of metallurgy, electronic materials, glass and ceramic technology, physical and chemical processes in fluids, electrophoretic separation, and techniques and equipment design. Some results from the Skylab program are included. Experimental designs for the Apollo Soyuz Test Project and Spacelab program are presented. For individual titles, see N75-19286 through N75-19318.

N75-19286* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SKYLAB EXPERIMENTS ON METALS **c37**
C. A. Lundquist *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 1-10 refs (For availability see N75-19285 11-12)

The Skylab Materials Processing Facility is described. Eight experiments on metal processing under near-zero-gravity conditions were performed in this facility. Three of these involved metals and procedures of potential application to fabrication in space. A multipurpose electric furnace within the Materials Processing Facility was employed to heat three ampoules of samples for each of the other five experiments. These five investigations cover diffusion versus convection rates in molten zinc, several immiscible alloy compositions, a whisker-reinforced silver-based composite, heat treating of porous silver samples, and a copper-aluminum eutectic.
Author (ESRO)

N75-19287 Case Western Reserve Univ., Cleveland, Ohio. Dept. of Fluid, Thermal and Aerospace Sciences.
SKYLAB SCIENCE DEMONSTRATIONS **c76**
S. Ostrach *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 11-18 (For availability see N75-19285 11-12)

A number of scientific phenomena were observed in the reduced-gravity environment that either could not be reproduced under normal gravity or were expected to be different. Surface-tension-dominated situations included ice melting, liquid floating-zone dynamics, liquid films, and liquid-sphere dynamics. The diffusion of one liquid into another, the recoalescence of immiscible liquids, Rochelle salt (sodium potassium tartrate) crystal growth, and deposition of silver crystals were studied because gravity usually plays an important role in these processes. Other experiments were concerned with charged particle mobility, gyroscopic principles, and orbital mechanics. The demonstrations were primarily developed using on-board materials such as water, soap, safety wire, oil and the like.
Author (ESRO)

N75-19288* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SKYLAB EXPERIMENTS ON SEMICONDUCTORS AND ALKALI HALIDES **c76**
C. A. Lundquist *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 19-26 refs (For availability see N75-19285 11-12)

The space processing experiments performed during the Skylab missions included one on single crystal growth of germanium selenide and telluride, one on pure and doped germanium crystals, two on pure and doped indium antimonide, one on gallium-indium-antimony systems, and one on a sodium chloride-sodium fluoride eutectic. In each experiment, three ampoules of sample were processed in the multipurpose electric furnace within the Skylab Materials Processing Facility. All were successful in varying degrees and gave important information about crystal growth removed from the effects of earth surface gravity.
Author (ESRO)

N75-19289 Louvain Univ. (Belgium). Dept. of Metallurgy.
SILVER SAMPLES MELTED IN SKYLAB EXPERIMENT M565 **c26**
A. Deruyttere, E. Aernoudt, H. Goeminne, J. Smeesters, O. Arkens, and M. Verhaeghen *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 27-44 refs (For availability see N75-19285 11-12)

A preliminary study was made of the behavior of porous material when melted and resolidified under conditons of zero gravity. Two kinds of samples were used: perforated discs and a fiber compact. The observations made on the various specimens are presented and compared with those made on similar specimens treated in like manner on the ground. Conclusions show: (1) most of the original porosity in the samples disappears during the melting stage, (2) sample shape is altered on solidification due to both shrinkage pipe formation and constitutional supercooling, (3) the levelling out of impurity concentration gradients appears to be slow in the molten metal when gravity-induced convection is absent, and (4) when only a part of a solid body is melted under zero gravity, the tendency for the molten part to become spherical may be much reduced.
Author (ESRO)

N75-19290 Welding Inst., Cambridge (England).
METALLOGRAPHIC ASSESSMENT OF SKYLAB EXPERIMENT M551 **c39**
J. G. Garland and D. McKeown *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 45-64 refs (For availability see N75-19285 11-12)

Electron beam welds made in three materials under conditions of zero gravity were compared with similar welds produced on earth. Full and partial penetration welds in 2219-T87 aluminum alloy, AISI 304 stainless steel and pure tantalum were examined. Metallographic techniques were developed during the program which facilitated observation of the solidification and segregation structures of the materials, including the use of the scanning electron microscope and electron probe micro-analyser. Differences in structure between welds made with and without gravity were found to be small.
Author (ESRO)

N75-19291* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ASTP MULTIPURPOSE FURNACE EXPERIMENTS **c76**
C. A. Lundquist *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 65-69 refs (For availability see N75-19285 11-12)

The Apollo-Suyuz Test Project (ASTP), to be conducted jointly in 1975 by the United States and the Soviet Union, will carry a multipurpose electric furnace rather similar to that carried on the Skylab. This furnace facility will be used to process samples for seven experiments to investigate how crystals grow and molten materials solidify under near-zero-gravity conditions. An outline of the program is given.
Author (ESRO)

N75-19292* National Aeronautics and Space Administration, Washington, D.C.
NASA PLANS FOR SPACE-PROCESSING EXPERIMENTS ON SOUNDING ROCKETS
J. H. Bredt *In* ESRO Process. and Manufacturing in Space

Jul. 1974 p 71-73 (For availability see N75-19285 11-12)

Planning for sounding rocket space processing experiments in the second half of 1975 is reported. Currently operational sounding rocket systems are capable of carrying payloads containing more than 50 kg of experimental apparatus on trajectories including between 5 and 10 min of coasting flight above 100 km altitude. When equipped with stabilization systems to nullify angular velocities in their rotational degrees of freedom, these vehicles can provide an environment in which accelerations are less than 1 mm/sec per 2. The cost of flight operations to implement a rocket experiment program will be of the order of 2000 dollars per kg of discretionary payload, and within the next two years newly operational systems are expected to reduce the cost to about 700 dollars per kg. Author (ESRO)

N75-19293* National Aeronautics and Space Administration, Washington, D.C.

STATUS OF NASA SPACE-PROCESSING RESEARCH

J. H. Bredt *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 75-85 refs (For availability see N75-19285 11-12)

A survey is presented of the history, goals, objectives, and implementation of the NASA space processing program. Program activities have resulted in the present division of interests into metallurgical processes, electronic materials, biological applications, ceramics and glass, physical properties in fluids, and chemical processes. An outline is given of space shuttle payload development. ESRO

N75-19294 European Space Research Organization, Paris (France).

REVIEW OF EUROPEAN SPACE-PROCESSING ACTIVITIES

G. Seibert *In its* Process. and Manufacturing in Space Jul. 1974 p 87-95 (For availability see N75-19285 11-12)

The tasks and activities of two ESRO working groups in the space processing field: PAMIS (processing and manufacturing in space) and PASE (post-Apollo space electrophoresis) are described. The purpose and output of ESRO supported industrial studies are discussed. In addition to the industrial studies, several ESRO consultant studies on equipment required for the Spacelab space processing laboratory were carried out. Results are summarized and space processing activities in different European countries are reviewed. Author (ESRO)

N75-19295 European Space Research and Technology Center, Noordwijk (Netherlands).

THE EUROPEAN SPACELAB PROGRAMME

W. Nellessen and G. Peters *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 97-112 (For availability see N75-19285 11-12)

A survey on the objectives and the definition status of the European Spacelab Program is presented. Spacelab, designed and developed as a European contribution to the post Apollo Program, provides a cost effective, versatile, reusable, and manned payload carrier facility for accommodating laboratory and observatory equipment on sortie missions in space. Using as transporter the American space shuttle system, Spacelab can be launched in different configurations comprising a pressurized module, an unpressurized pallet, or combinations of modules and pallets. The Spacelab system characteristics are described and a brief outline of Spacelab accommodation provisions for scientific and application experiments is given. Author (ESRO)

N75-19296* National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, Ala.

REQUIREMENTS AND CONCEPTS FOR SPACE-PROCESSING PAYLOADS

K. R. Taylor, R. L. Hammel (TRW Systems Group, Redondo Beach, Calif.), P. R. Mock (TRW Systems Group, Redondo Beach, Calif.), A. G. Smith (TRW Systems Group, Redondo Beach, Calif.), and R. D. Stevenson (TRW Systems Group, Redondo Beach, Calif.) *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 113-135 refs (For availability see N75-19285 11-12)

The definition of facilities which will serve the research needs of a large group of users is given. These facilities (payloads) are derived by several combinations of items from a large inventory of modular, reusable, research equipment which enables ready response to many flight opportunities. Workable concepts were prepared and submitted to the Spacelab design activity. These designs permit the flying of either partial or dedicated payloads. The technical integrity of the modular approach to payload design/integration and the utility of commercial equipment technology are also discussed. Author (ESRO)

N75-19297 Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).

PAMIS: A EUROPEAN USER REQUIREMENTS STUDY

B. Franke *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 137-154 (For availability see N75-19285 11-12)

The requirements of space processing experiments (SPE) are discussed and details on the equipment needed to operate them supplied. Information of SPE accommodation in Spacelab is provided and the results of a comparison between the requirements of 10 SPE's and Spacelab capabilities are presented. Conclusions are drawn and recommendations made with the aim of achieving compatibility between the requiremsnts of various SPE's and the actual capabilities of the Spacelab and its subsystem. To this end, modifications were considered to either the Spacelab subsystem and/or SPE requirements. Spacelab accommodation of modified SPE payloads is reviewed and the preferred arrangement of the SPE payload within the Spacelab configuration is shown. Author (ESRO)

N75-19298 Hamburg Univ. (West Germany).

METALLURGICAL APPLICATIONS OF A SPACE ENVIRONMENT c26

H. Ahlborn *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 155-162 (For availability see N75-19285 11-12)

Different concepts of metallurgical application in the space environment are summarized. Peculiarities and advantages of a space environment which may be useful for metallurgy itself and for research in this field are considered. Materials and processes that can possibly be influenced by a space environment are surveyed. Two examples are given of how research are considered. Materials and processes that can possibly be influenced by in space might be used for the development of new materials: the preparation of two-phase materials and of reinforced materials. ESRO

N75-19299 Stuttgart Univ. (West Germany). Kristallab.

SINGLE CRYSTALS OF ELECTRONIC MATERIALS GROWN IN A SPACE ENVIRONMENT c76

K. W. Benz *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 163-169 refs (For availability see N75-19285 11-12)

The most important electronic materials as regards possible growth methods in a space environment and the results of the Skylab mission are discussed. The most common growth methods are: Bridgman and Czochralski techniques, floating zone techniques, and the techniques of solution and vapor growth. The materials reviewed are semiconductors, magnetic bubble memory crystals, and electro-optical crystals. Author (ESRO)

N75-19300 Polytechnical Univ. of Madrid (Spain). Lab. of Aerodynamics.

SOME PHYSICAL AND CHEMICAL PROCESSES IN FLUIDS c34

I. DaRiva *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 171-183 refs (For availability see N75-19285 11-12)

The effects of zero gravity conditions on several fluid dynamics problem areas are reviewed. Thermal convection under reduced gravity, the affect of surface gravity waves at the outset of convection induced by surface tractions, the problem of gravity and chemical reactions, and sound velocity measurement in a liquid containing bubbles are discussed. Author (ESRO)

N75-19301 Ernst Leitz G.m.b.H., Optischewerke, Wetzlar (West Germany).

THE INFLUENCE OF SPACE PROCESSING ON GLASS TECHNOLOGY c27

K. Deutscher *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 185-190 refs (For availability see N75-19285 11-12)

A survey of the major trends in glass research and development in the fields of optics, telecommunication, and electronics is presented. Experiments proposed for the Spacelab are discussed

with respect to the support space conditions may provide for the development of new or improved glasses in these fields.
Author (ESRO)

N75-19302* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SPACE PROCESSING OF CERAMIC MATERIALS c27
C. H. Savage and M. H. Leipold *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 191-197 refs (For availability see N75-19285 11-12)
(Contract NAS7-100)

A review was made of the processing of ceramic materials in space and of those space environment factors appearing to be useful in the processing of this class of materials. Applicability of these factors to various processing procedures appropriate to ceramics, such as containerless melting, is discussed. Specific applications of these procedures in developing new and improved products and processes are reviewed. ESRO

N75-19303 Max-Planck-Institut fuer Biochemie, Martinsried bei Muenchen (West Germany).
APPLICATION: GENERAL REVIEW c51
K. Hannig *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 199-203 refs (For availability see N75-19285 11-12)

A review was made of the basic biological experiments performed in space, and some of the results obtained are discussed. The effects of weightlessness on biological organisms were found at all cellular levels. Preparative separation and purification methods, especially effective under conditions of weightlessness, were stressed. Author (ESRO)

N75-19304* National Aeronautics and Space Administration, Washington, D.C.
SPACE PROCESSING ECONOMICS c83
J. H. Bredt *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 205-208 (For availability see N75-19285 11-12)

Two types of space processing operations may be considered economically justified; they are manufacturing operations that make profits and experiment operations that provide needed applied research results at lower costs than those of alternative methods. Some examples from the Skylab experiments suggest that applied research should become cost effective soon after the space shuttle and Spacelab become operational. In space manufacturing, the total cost of space operations required to process materials must be repaid by the value added to the materials by the processing. Accurate estimates of profitability are not yet possible because shuttle operational costs are not firmly established and the markets for future products are difficult to estimate. However, approximate calculations show that semiconductor products and biological preparations may be processed on a scale consistent with market requirements and at costs that are at least compatible with profitability using the Shuttle/Spacelab system. Author (ESRO)

N75-19305 Battelle Inst., Frankfurt am Main (West Germany).
MANUFACTURING OF COMPOSITE MATERIALS IN SPACE c24
K. H. Gruenthaler and D. Sethna *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 211-217 refs (For availability see N75-19285 11-12)

The influence of dispersion and volume fraction of reinforcing materials on space manufacturing of composite materials was studied. Consideration was also given to material surface treatment and selection criteria. The manufacturing possibilities for various composites including foamed metals, are presented.
Author (ESRO)

N75-19306 Louvain Univ. (Belgium). Lab. of Physical Metallurgy.
PREPARATION OF ALLOYS UNDER SPACE CONDITIONS c26
A. Berghezan *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 219-228 refs (For availability see N75-19285 11-12)

The effect of space conditions, particularly zero gravity, on various phenomena associated with the production of alloys, e.g. nucleation and growth of crystals, and segregation was studied. Some of the problems associated with processing in space such as melt degassing are examined. It concluded that much parallel experimentation in space and on earth will be required to examine the feasibility of space processing. Author (ESRO)

N75-19307 Fulmer Research Inst., Ltd., Stoke Poges (England).
MULTIPHASE SOLIDIFICATION c26
C. D. Desforges *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 229-234 refs (For availability see N75-19285 11-12)

Essential features of solidification are discussed, with particular attention given to the production of controlled microstructures e.g. unidirectionally solidified eutectics. The problems encountered in liquid-solid transformations and presently available methods of overcoming them are presented. Possible benefits of alloy solidification in zero gravity conditions, such as elimination of lamellar defects and banding in eutectics, and convective fluid flow and its influence on segregation patterns are outlined.
Author (ESRO)

N75-19308 Centre National de la Recherche Scientifique, Meudon (France).
ELECTRONIC MATERIALS: PURIFICATION AND SPACE CONDITIONS c76
H. Rodot *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 243-246 (For availability see N75-19285 11-12)

Problems concerning the purity of electronic materials including contaminationless ultra-purification and crystal-growth processes are described. Usual terrestrial purification methods are outlined and the influence of gravity on the results obtained is analyzed. Space conditions, space vacuum and zero gravity, relevant to purification techniques are analyzed. The possibilities for applying these conditions to improve known methods, floating zone technique, or to achieve new space processes are evaluated. Author (ESRO)

N75-19309 Laboratoires d'Electronique et de Physique Appliquee, Paris Limeil-Brevannes (France).
GROWTH OF LARGE SINGLE CRYSTALS AND PERFECTION PROBLEMS CONNECTED WITH THE GRAVITATIONAL FIELD c76
C. Belouet *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 247-259 refs (For availability see N75-19285 11-12)

The limitations of crystalline perfection, which are ascribed to the presence of gravity, are reviewed for each growth method. A list of large single crystals of relevance in electronics is given in relation to the various growth techniques practiced. Examples of the Czochralski growth of garnets and the pedestal growth of silicon are presented. The relative interest of a zero gravity environment for each growth method is reviewed. It is anticipated that the high homogeneity expected of space grown crystals might result, at least for particular crystals, in a great improvement in their physical properties. Author (ESRO)

N75-19310 Battelle Inst., Frankfurt am Main (West Germany).
CRYSTAL GROWTH OF OXIDES USING A CO2 LASER c76
R. Beck *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 261-265 (For availability see N75-19285 11-12)

The application of the crucible-free floating-zone technique for growth of certain dielectric crystals in space, using CO2 laser heating to produce the molten zone, is discussed. Advantages of crystals grown in space include gravity induced convection currents in the melt and improved stability conditions for the molten zone. Gravity on earth restricts use of the floating zone technique to the growth of crystals of relatively small diameter, whereas in space highly perfect crystals of practically unlimited diameter can be obtained. Of special interest is the space production of certain dielectric crystals, since these are of great scientific and technical significance and have a particularly high price per unit weight. A CO2 laser is suitable for the production of the molten zone, since the laser beam can be focussed on the crystal without loss and the radiation will be almost completely absorbed. Author (ESRO)

N75-19311 Simon Stevin Instituut voor Wetenschappelijk Onderzoek, Brugge (Belgium).
SPECIFIC PROBLEMS OF ELECTROPHORESIS IN SPACE

H. Peeters *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 273-278 refs (For availability see N75-19285 11-12)

Advantages and problems of spaceborne electrophoresis resulting from weightless operation are discussed. The absence of convection due to density gradient is an advantage of unquestionable value with several electrophoretic procedures in space. For continuous preparation electrophoretic methods, gravity is useful in the separation process. The possibility of space separation of living cells requires the solution of a set of logistics problems that occur before, during, and after the separation procedure itself. A real advantage of space lies in a domain where gravity interferes with the electrophoretic principle through viscosity. Absence of gravity removes the normal damping effects to slight disturbing forces such as electroendosmosis, noise-generated convection, and small acceleration gradients due to the movement of the separation cell. ESRO

N75-19312 Scottish National Blood Transfusion Service, Edinburgh.

ISOELECTRIC FOCUSING AND FORCED-FLOW ELECTRO-PHORESIS

J. G. Watt *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 279-282 (For availability see N75-19285 11-12)

Isoelectric focusing and forced flow electrophoresis both encourage molecular migration in unsupported liquid media. The first system allows migration over relatively long distances while the second system, intended for relatively large scale processing, allows migration in a short path. Both systems posses disadvantages in relation to the recovery of separated fractions and both suffer interference due to convective forces created by the passage of high tension direct current through the liquid medium. These effects can be removed from both systems in low gravity operation with a decided improvement in equipment versatility and degree of separation as the main reward is argued that forced flow electrophoresis, freed from the constrictions of convection, could provide a completely new electrophoretic technique of high resolution prior and unique to the space environment. Author (ESRO)

N75-19313 Max-Planck-Institut fuer Biochemie, Martinsried bei Muenchen (West Germany).

ASTP EXPERIMENT MA 014

K. Hannig *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 283-287 (For availability see N75-19285 11-12)

The design of an electrophoresis experiment for the Apollo Soyuz Test Project is presented. The experiment was planned in view of future electrophoresis biological experiments aboard Spacelab. A prime objective of the experiment is to investigate whether the supposed and theoretically established increase in separation sharpness and a ten-fold increase in throughput capacity can be achieved through lack of convection disturbances. The principle of free-flow electrophoresis is described, as well as the design goal and function of the experiment. It is planned to separate three samples: a mixture of human and rabbit erythrocytes, a mixture of B- and T-lymphocytes, and bone marrow cells. ESRO

N75-19314 Scottish National Blood Transfusion Service, Edinburgh.

ELECTROPHORESIS DATA RETRIEVAL FOR ANALYSIS AND PROCESS CONTROL

P. R. Foster and D. A. Ross *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 289-299 refs (For availability see N75-19285 11-12)

(Contract ESRO-73/143-245-PAMIS)

The evaluation of data acquisition requirements for the Spacelab electrophoresis laboratory called Biological Sub-element is reviewed. Possible experimental and preparative systems are suggested and the different elements of these modes of operation are integrated into a composite flow scheme. Aspects of process control are discussed and the output from analytical instrumentation is considered. Data rate requirements are assessed with regard to the computer facilities likely to be available. Limitations inherent in the study are stressed, and areas that require further investigation are identified. Author (ESRO)

N75-19315 Battelle Inst., Frankfurt am Main (West Germany).

ULTRASONIC POSITIONING AND STIRRING c37

E. G. Lierke *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 303-310 refs (For availability see N75-19285 11-12)

Ultrasonic methods for contactless positioning and stirring of molten materials are evaluated theoretically. The basic theory is supported by simple experimental observations at 20 kHz. Upper limits for the positioning force/power ratio are discussed. Author (ESRO)

N75-19316 Tocco-Stel, Massy (France).

USE OF ELECTROMAGNETIC FIELDS FOR POSITIONING AND STIRRING MATERIALS UNDER ZERO GRAVITY c37

J. Reboux *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 311-326 refs (For availability see N75-19285 11-12)

From results obtained on earth, inductive systems for positioning, stirring, and heating a conductive sample in space can be designed. An assembly of 2 or 3 coils connected to power generators with a maximum power 200 W at 20 to 30 kHz can be used to develop positioning forces of about 0.001 N. Circular coils, of one or two turns, are proposed for accurate positioning of the sample at the heating location. Stirring of the melted sample is effected by another auxiliary power generator connected to a heating coil sited between the upper and lower positioning coils. A method of simulating zero gravity, which can be of some help in studying the technology of positioning coils, is also proposed. The combination of positioning and stirring coils with heating by an auxiliary source is also discussed. Author (ESRO)

N75-19317 Giessen Univ. (West Germany). Inst. fuer Physik.

DETAILED DESCRIPTION OF A SPACE-PROCESSING FURNACE c35

R. Grasser and A. Scharmann *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 327-334 refs (For availability see N75-19285 11-12)

A new development in resistance heated furnaces with a special thermal insulation, consisting of ZrO2 - coated metal foils is described. The zone containing the heating elements is surrounded with this foil, use of which, as heat shields gives the furnace a number of very remarkable features. The furnace is highly suited for applications in zero gravity space laboratories. Author (ESRO)

N75-19318 British Aircraft Corp. (Operating) Ltd., Bristol (England).

APPARATUS, TECHNIQUES AND PHYSICAL PARAMETERS OF SOUNDING-ROCKET FLIGHTS

G. Lewis *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 335-338 ref (For availability see N75-19285 11-12)

The use of the Skylark sounding rocket is proposed for providing the low gravity environment needed for the development of apparatus and techniques for space processing manufacture. The most important payload-related physical parameters are: 350 kg payload weight, 150 L payload volume, 13 min at low gravity levels, and availability of telemetry and telecommand. A parachute recovery system was developed with a weight penalty of 30 kg. ESRO

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N75-19319# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

STUDY OF A VARIABLE STRUCTURE SYSTEM FOR CONTROL OF DESCENT IN THE ATMOSPHERE TAKING INERTIA INTO ACCOUNT IN THE FINAL ADJUSTMENT OF THE CONTROL COMMAND

B. V. Victorov, L. G. Oleinichenko, and I. S. Ukolov 15 Nov. 1974 16 p refs Transl. into ENGLISH from Probl. Aviats. i Kibernetiki (Moscow), v. 6, no. 53, 1972 p 47-54

(FTD Proj. T74-05-38A)
(AD-A001865; FTD-MT-24-2839-74) Avail: NTIS CSCL 22/3

It was found that the inertia in the final adjustment of the control command exerts a substantial influence on the quality of control processes. The use of logical laws of control increases the need for conducting a joint examination of the total motion of the descent vehicle, and for the determination of the effect of comparatively rapid vibrations of the descent vehicle (relative to the center of mass) on the nature of control of trajectory motion parameters. M.J.S.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

N75-19320# Chr. Michelsen Inst., Bergen (Norway). Dept. of Applied Physics.
THE NTNF ANDOYA ROCKET LAUNCHER
Odd Dahl, ed., Jan A. Andersen, ed., Rolf Bjurstroem, D. J. Brown, H. Ingebrigtsen, R. Franck-Petersen, and A. Soereide May 1974 55 p
(T-142; Rept-72017-1) Avail: NTIS HC $4.25

Design aspects of a rocket launcher for the Norwegian Rocket Range at Andoya are presented. Performance requirements, the remote control system, and a structural analysis program based on the maximum expected dynamic forces are discussed. The launcher was tested to verify the design figures of stresses and deflections of the various points of the launcher. Test results are summarized. J.M.S.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N75-19321 Stanford Univ., Calif.
INTEGRAL CONTROL OF A SPINNING DRAG-FREE SATELLITE Ph.D. Thesis
Michael Gregory Tashker 1974 277 p
Avail: Univ. Microfilms Order No. 74-27127

The classical theory of integral control is extended to the reduction of errors in the presence of nonconstant forces that can be modelled by differential equations. The performance of systems with integral control and estimators to generate missing states is studied. A spinning body possesses symmetry that enables its behavior to be described by differential equations of lower order with explicit complex terms. The techniques of complex symmetry are applied to the synthesis of a control system for the spinning drag-free satellite. Classical synthesis and analysis techniques are extended to complex symmetric systems. These include the complex symmetric root locus, Bode plot, polar plot and Nyquist criterion, and root square locus for optimal control. The control system was mechanized on a laboratory simulator to demonstrate the performance of the system with integral control. The effects of parameter variation and system nonlinearities are reported. Dissert. Abstr.

N75-19322*# National Aeronautics and Space Administration, Washington, D.C.
VIKING
Feb. 1975 36 p
(NASA-News-Release-75-42) Avail: NASA Scientific and Technical Information Facility P.O. Box. 8757 Baltimore/Washington International Airport, Md. 21240 CSCL 22B

The Viking program, its characteristics, goals, and investigations are described. The program consists of launching two spacecraft to Mars in 1975 to soft-land on the surface and test for signs of life. Topics discussed include the launch, the journey through space, tracking, Mars orbit and landing, experiments on the search for life, imaging systems, lander camera, water detection experiments, thermal mapping, and a possible weather station on Mars. M.J.S.

N75-19323*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
LAGEOS PHASE B TECHNICAL REPORT
Feb. 1975 109 p refs
(NASA-TM-X-64915) Avail: NTIS HC $5.25 CSCL 22B

Analysis and design of the LASER Aerodynamic Satellite was performed and the design integrated with the launch vehicle interfaces and launch operations. The satellite has a requirement to be compatible with techniques for ranging from earth to satellite to an accuracy of + or - sq cm. The results indicate the satellite design while maintaining low program cost, met the design and mission requirements. Trade studies and satellite design are documented along with thermal and optical tests. Author

N75-19324# National Aerospace Lab., Tokyo (Japan).
THE EQUATIONS OF MOTION OF AN ELASTIC LAUNCH VEHICLE WITH VARYING MASS. 1: BASIC EQUATIONS
Kiichi Tatera Aug. 1974 12 p refs In JAPANESE; ENGLISH summary
(NAL-TR-377) Avail: NTIS HC $3.25

General three dimensional dynamic equations of motion for a launch vehicle with varying mass are derived, having effects of airframe bending, propellant sloshing, propellant flow and engine swivelling into account. The effect of propellant flow is considered as reaction forces of propellant to airframe, and using the theory of continuum mechanics the time rate of change of integrals of some quantities are being transferred out of the system. Sloshing and bending equations are derived accurately, in view of practical analysis of the whole motion of the vehicle. Author

N75-19325# National Aerospace Lab., Tokyo (Japan).
SPIN AXIS CONTROL OF AN AXI-SYMMETRIC SATELLITE USING AN AXIAL GAS JET AND SPIN AXIS BEHAVIOR DURING CONTROL
Chikara Murakami, Yoshiaki Ohkami, and Atsushi Nakajima Aug. 1974 22 p refs In JAPANESE; ENGLISH summary
(NAL-TR-380) Avail: NTIS HC $3.25

The main methods of spin axis control, the rhumb line method and the great circle method, are discussed along with ways of determining the jet firing time. Spin axis behavior during reorientation maneuver is analyzed, and it is shown that its pattern represents a sort of beat phenomena. To clarify the influence of a non-impulsive jet on nutational behavior of the spin axis, a method of replacing the jet by an equivalent impulsive jet is proposed. This method provides a powerful tool to analyze the spin axis behavior during reorientation maneuver. Computer simulation results show that the rhumb line method using a sun sensor as a jet timing reference is superior to the great circle method. Author

N75-19326# National Aerospace Lab., Tokyo (Japan).
ZONAL HARMONIC PERTURBATIONS IN THE MOTION OF AN ARTIFICIAL SATELLITE. THE FIRST-ORDER THEORY BY VON ZEIPEL'S METHOD
Sumio Takeuchi Aug. 1974 34 p refs In JAPANESE; ENGLISH summary
(NAL-TR-384) Avail: NTIS HC $3.75

Perturbative effects of earth oblateness on the motion of an artificial satellite are investigated by von Zeipel's modification of the method of Delaunay. In Delaunay variables, both additions to the secular motions and long-periodic terms are found for zonal harmonic of any order above the second. The complete solution of the problem is given by Brouwer's first-order solution of the main problem and the secular and long-periodic contributions caused by the zonal harmonics added to the principal term and the second harmonic. It is assumed that J sub 2 is a small quantity of the first order, and all other coefficients J sub p for $p > 2$ are of the second order. The numerical values of the coefficients of eccentricity functions and those of inclination

functions are given for the gravitational potential of the earth represented by the sum of the central field and the perturbing potential up to the twenty-first order. The theory is applied to the sun-synchronous orbit to calculate the variations of the orbital elements. Author

N75-19327*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SIMULATION OF A LUNAR GRADIOMETER MISSION
Peter D. Argentiero and Raul Garza-Robles Dec. 1974 26 p refs Submitted for publication
(NASA-TM-X-70857; X-932-74-358) Avail: NTIS HC $3.75 CSCL 22A

A lunar gradiometer mission involves the mounting of a gradiometer on a satellite which is in a low, polar, and circular lunar orbit. The results of a numerical simulation of the mission is presented. It is shown that if the satellite is in a 50 km orbit, 1 deg and 2 deg gravity anomalies may be estimated with accuracies of 12 mgal and 1 mgal respectively. At a 100 km altitude, 2 deg gravity anomalies can be estimated with an accuracy of 12 mgal. These results assume a rotating type gradiometer with a .1E accuracy. The results can be readily scaled to reflect another level. Author

N75-19328# Frequency and Time Systems, Inc., Danvers, Mass.
CESIUM-ATOMIC BEAM OSCILLATOR TECHNOLOGY FOR NAVIGATION SATELLITES Final Report
1 Oct. 1974 40 p
(Contract N00014-74-C-0061)
(AD-A000397; F6174) Avail: NTIS CSCL 17/7

This report presents the results of the second phase of the program of research and exploratory development directed toward cesium atomic-beam-stabilized oscillators for navigation satellite applications. The specific objectives of the second phase were: (1) Qualification of a cesium beam tube; (2) Block diagram of proposed standard; (3) System analysis of proposed standard; (4) Design of demonstrable breadboard model. GRA

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

No abstracts in this category.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

No abstracts in this category.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N75-19329* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACE VEHICLE Patent
George L. VonPragenau, inventor (to NASA) Issued 18 Feb. 1975 7 p Filed 21 Mar. 1974 Supersedes N74-20541 (12 - 11, p 1355)
(NASA-Case-MFS-22734-1; US-Patent-3,866,863; US-Patent-Appl-SN-453232; US-Patent-Class-244-162) Avail: US Patent Office CSCL 22B

A space vehicle having an improved ascent configuration for use in traveling in space is presented. Components of the vehicle are: (1) a winged orbiter having an elongater fuselage and rearwardly directed main engines fixed to the fuselage; (2) an elongated tank assembly of an improved configuration disposed forwardly of the fuselage and connected with the main engines of the vehicle for supplying liquid propellants; and (3) a booster stage comprising a pair of integrated solid rocket boosters connected with the orbiter immediately beneath the fuselage and extended in substantial parallelism.
Official Gazette of the U.S. Patent Office

N75-19330*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
DETAILED REQUIREMENTS DOCUMENT FOR STOWAGE LIST AND HARDWARE TRACKING SYSTEM (SLAHTS)
D. J. Keltner Feb. 1975 134 p
(Contract NAS9-12200)
(NASA-CR-141703; LEC-5362; JSC-09405) Avail: NTIS HC $5.75 CSCL 22B

The stowage list and hardware tracking system, a computer based information management system, used in support of the space shuttle orbiter stowage configuration and the Johnson Space Center hardware tracking is described. The input, processing, and output requirements that serve as a baseline for system development are defined. Author

N75-19331*# Martin Marietta Corp., Baltimore, Md.
INSTABILITY OF A GRAVITY GRADIENT SATELLITE DUE TO THERMAL DISTORTION Final Report
Robert L. Goldman Washington NASA Mar. 1975 133 p refs
(Contract NAS5-22230)
(NASA-CR-2516; TR-74-02c) Avail: NTIS HC $5.75 CSCL 22B

A nonlinear analytical model and a corresponding computer program were developed to study the influence of solar heating on the anomalous low frequency, orbital instability of the Naval Research Laboratory's gravity gradient satellite 164. The model's formulation was based on a quasi-static approach in which deflections of the satellite's booms were determined in terms of thermally induced bending without consideration of boom vibration. Calculations, which were made for variations in absorptivity, sun angle, thermal lag, and hinge stiffness, demonstrated that, within the confines of a relatively narrow stability criteria, the quasi-static model of NRL 164 not only becomes unstable, but, in a number of cases, responses were computed that closely resembled flight data. Author

N75-19332*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
DESIGN AND FABRICATION OF A HIGH TEMPERATURE LEADING EDGE HEATING ARRAY, PHASE 1 Final Report, 29 Jun. - 5 Dec. 1972
5 Dec. 1972 115 p ref
(Contract NAS9-13091)
(NASA-CR-141713; MDC-E0731-Ph-1) Avail: NTIS HC $5.25 CSCL 22B

Progress during a Phase 1 program to design a high temperature heating array is reported for environmentally testing full-scale shuttle leading edges (30 inch span, 6 to 15 inch radius) at flight heating rates and pressures. Heat transfer analyses of the heating array, individual modules, and the shuttle leading edge were performed, which influenced the array design, and the design, fabrication, and testing of a prototype heater module. Author

N75-19333*# Chrysler Corp., New Orleans, La.
RESULTS OF INVESTIGATION ON AN 0.015 SCALE CONFIGURATION 140A/B SPACE SHUTTLE VEHICLE ORBITER REACTION CONTROL SYSTEM PLUME-IMPINGEMENT MODEL 36-0 IN THE NASA/AMES RESEARCH CENTER 3.5-FOOT HYPERSONIC WIND TUNNEL (0A83)
M. E. Nicholas and T. E. Polek Mar. 1975 340 p Prepared by Rockwell Intern. Corp.
(Contract NAS9-13247)
(NASA-CR-141510; DMS-DR-2177) Avail: NTIS HC $9.50 CSCL 22B

The results of aerodynamic pressure and wingroot bending-moment testing conducted on a 0.015-scale configuration 140A/B space shuttle vehicle orbiter reaction control system plume-impingement model are documented. The model was investigated at nominal Mach numbers of 5.3, 7.3, and 10.3, at unit Reynolds numbers of 4,200,000 ft, 7,300,000 ft, and 1,700,000 ft. Model attitude was varied in angle of attack from 18 deg to 38 deg at angles of sideslip from -2 deg to +2 deg. The test program was conducted to establish and reaffirm incremental orbiter pressure-profile and structural-loads data due to operation of the aftbody reaction control system pitch-down engines. Author

N75-19334*# TRW Systems Group, Redondo Beach, Calif.
SATURN URANUS ATMOSPHERIC ENTRY PROBE MISSION SPACECRAFT SYSTEM DEFINITION STUDY Final Report
15 Jul. 1973 595 p refs
(Contract NAS2-7297)
(NASA-CR-137648; TRW-23267-6001-RU-00) Avail: NTIS HC $13.25 CSCL 22B

The modifications required of the Pioneer F/G spacecraft design for it to deliver an atmospheric entry probe to the planets Saturn and Uranus are investigated. It is concluded that it is feasible to conduct such a mission within the constraints and interfaces defined. The spacecraft required to perform the mission is derived from the Pioneer F/G design, and the modifications required are generally routinely conceived and executed. The entry probe is necessarily a new design, although it draws on the technology of past, present, and imminent programs of planetary atmospheric investigations. Author

N75-19335*# Chrysler Corp., New Orleans, La. Space Div.
WIND TUNNEL TESTS OF THE 0.010-SCALE SPACE SHUTTLE INTEGRATED VEHICLE (MODEL 52-OT) IN THE NASA/AMES 3.5-FOOT HYPERSONIC WIND TUNNEL (IA18)
V. Esparza (Rockwell Intern., Downey, Calif.), E. Chee (Rockwell Intern., Downey, Calif.), J. Stone (Rockwell Intern., Downey, Calif.), and J. A. Mellenthin (NASA. Ames Res. Center) Mar. 1975 115 p
(Contract NAS9-13247)
(NASA-CR-134413; DMS-DR-2160) Avail: NTIS HC $5.25 CSCL 22B

Experimental aerodynamic investigations were conducted in the NASA/Ames Research Center 3.5-foot hypersonic wind tunnel on an 0.010-scale model of the space shuttle integrated vehicle consisting of an orbiter and external tank. The basic hypersonic stability characteristics of the orbiter attached rigidly to the external tank and the basic hypersonic stability characteristics of external tank alone simulating RTLS abort conditions were evaluated. The integrated vehicle was tested at angles of attack from -8 deg through +30 deg and angles of sideslip of- 8 deg through +8 deg at fixed angles of attack of -4 deg, 0 deg, and +4 deg. A maximum angle of attack range of +15 deg through +40 deg was obtained for this configuration, at Mach number 7.3, for one run only. External tank alone testing was conducted at angles of attack from +8 deg through -30 deg and angles of sideslip of -8 deg at fixed angles of attack of -4 deg, 0 deg and +4 deg. Six-component force data and static base pressures were recorded during the test. Author

N75-19336*# Chrysler Corp., New Orleans, La. Data Management Services.
RESULTS OF INVESTIGATION IA110 ON A 0.015-SCALE INTEGRATED CONFIGURATION OF THE SPACE SHUTTLE VEHICLE IN THE ARC 9 X 7 SUPERSONIC WIND TUNNEL USING MODELS 67-TS AND 49-0 Aerothermodynamic Data Report
E. Chee (Rockwell International Corp., Downey, Calif.) Feb. 1975 178 p
(Contract NAS9-13247)
(NASA-CR-141506; DMS-DR-2189) Avail: NTIS HC $7.00 CSCL 22B

An 0.015-scale space shuttle vehicle model was tested to investigate Orbiter wind bending, elevon panel loads, and elevon effectiveness. Mach numbers from 1.5 through 2.5 were investigated. Angles of attack and sideslip were varied from -8 degrees through +8 degrees. Post test analysis of raw wind tunnel data indicated a zero shift had occured in the wing bending and torsional gages during the test. The mechanism by which this shift occurred was not determined. Therefore, all the wind root bending and torsional moment data is suspect. Author

N75-19337*# Chrysler Corp., Detroit, Mich. Data Management Services.
AIRLOADS INVESTIGATION OF AN 0.030-SCALE MODEL OF THE SPACE SHUTTLE VEHICLE 140A/B LAUNCH CONFIGURATION (MODEL 47-OTS) IN THE ARC 11-FOOT UNITARY PLAN WIND TUNNEL FOR MACH RANGE 0.6 TO 1.4 (IA14A), VOLUME 2 Aerothermodynamic Data Report
R. L. Gillins (Rockwell Intern. Corp., Downey, Calif.) Mar. 1975 656 p refs 2 Vol.
(Contract NAS9-13247)
(NASA-CR-134444; DMS-DR-2084-Vol-2) Avail: NTIS HC $15.25 CSCL 22D

Results of tests conducted on an 0.030-scale launch configuration model of the space shuttle vehicle 140A/B in the NASA/ARC 11-foot unitary plan wind tunnel are presented. Aerodynamic loads data were obtained at Mach numbers from 0.6 to 1.4. Surface pressure distributions were obtained simultaneously with six-component stability and control force data on the complete launch configuration. The configuration consisted of the orbiter, an external tank, two solid rocket boosters, and associated intercomponent attach hardware. Angles of attack and sideslip from -10 degrees to +10 degrees were investigated. Author

N75-19338*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
DYNAMIC ANALYSIS OF THE GEOS SATELLITE Final Technical Report
Leonard Meirovitch, Jer-Nan Juang, and Ching-Pyng Chang Apr. 1975 35 p refs Sponsored in part by ESRO
(Grant NGR-47-004-126)
(NASA-CR-142353) Avail: NTIS HC $3.75 CSCL 22B

The assumed modes method is used to investigate the stability of the GEOS satellite. The system is discretized by representing the continuous displacement by finite series of space-dependent admissible functions multiplied by time-dependent generalized coordinates. The spatial dependence is eliminated by integration over the elastic domains, so that the testing functional reduces to a testing function. The sign properties of the testing function are then tested and the equilibrium defined as nontrivial. In considering the stability of small motions about nontrivial equilibrium, it is shown that if the analysis performed by ignoring the motion of the mass center indicates stability, then the system remains stable if the motion of the mass center is included. Author

N75-19339# Xerox Electro-Optical Systems, Pasadena, Calif.
SOLAR COLLECTOR THERMAL POWER SYSTEM. VOLUME 1: PRELIMINARY TECHNOLOGY SYSTEMS STUDY Final Report, 16 Aug. 1971 - 28 Jun. 1974

Robert Richter Nov. 1974 143 p refs 3 Vol.
(Contract F33615-72-C-1092; AF Proj. 3145)
(AD-A000940; Rept-4074-Vol-1; AFAPL-TR-74-89-1) Avail: NTIS CSCL 22/2

Work performed on the Solar Collector Thermal Power System (SCTPS) Program from 16 August 1971 to 28 June 1974 is presented. Volume I contains the system analysis for a solar collector thermal power system supplying thermal energy to a Vuilleumier cooler that is carried on a BMS type satellite. The analysis covers specific requirements of individual components of the power system, including the solar collector, heat pipes, and the thermal energy storage system. An extensive bibliography of pertinent heat transfer, solar collectors, and space power system reports is a part of this volume. GRA

N75-19340# Xerox Electro-Optical Systems, Pasadena, Calif.
SOLAR COLLECTOR THERMAL POWER SYSTEM. VOLUME 2: DEVELOPMENT, FABRICATION, AND TESTING OF FIFTEEN FOOT HEAT PIPES Final Report, 16 Aug. 1971 - 28 Jun. 1974
Robert Richter Nov. 1974 198 p refs 3 Vol.
(Contract F33615-72-C-1092; AF Proj. 3145)
(AD-A000941; Rept-4074-Vol-2; AFAPL-TR-74-89-2) Avail: NTIS CSCL 22/2

Technical effort in the development of a 15-foot long primary heat pipe capable of transferring 6 kW of thermal power and its integration with the remaining components of a complete thermal train is presented. The effort comprised the design, fabrication, and testing of the heat pipe as an individual component and the integration and testing with the secondary heat pipe, the thermal energy storage unit, and a radiation heat transfer joint. GRA

N75-19341# Xerox Electro-Optical Systems, Pasadena, Calif.
SOLAR COLLECTOR THERMAL POWER SYSTEM. VOLUME 3: BASIC STUDY AND EXPERIMENTAL EVALUATION OF THERMAL TRAIN COMPONENTS Final Report, 16 Aug. 1971 - 28 Jun. 1974
Robert Richter Nov. 1974 282 p refs
(Contract F33615-72-C-1092; AF Proj. 3145)
(AD-A000942; Rept-4074-Vol-3; AFAPL-TR-74-89-3) Avail: NTIS CSCL 22/2

Basic studies and the experimental evaluation of thermal train components are collected. This includes the tests of subscale thermal energy storage capsules, the design, fabrication, and testing of the secondary heat pipe with its full scale thermal energy storage unit; the design, fabrication, and testing of subscale heat pipes for the evaluation of material compatibility; the design, fabrication, and testing of a subscale heat pipe with a cavity receiver; and a heat pipe wick study performed in support of the design of a second primary heat pipe and the subscale cavity heat pipe. GRA

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

N75-19342*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GEOS-C ALTIMETER ATTITUDE BIAS ERROR CORRECTION
John W. Marini Dec. 1974 16 p refs Submitted for publication
(NASA-TM-X-70858; X-932-74-367) Avail: NTIS HC $3.25 CSCL 14B

A pulse-limited split-gate-tracking radar altimeter was flown on Skylab and will be used aboard GEOS-C. If such an altimeter were to employ a hypothetical isotropic antenna, the altimeter output would be independent of spacecraft orientation. To reduce power requirements the gain of the altimeter antenna proposed is increased to the point where its beamwidth is only a few degrees. The gain of the antenna consequently varies somewhat over the pulse-limited illuminated region of the ocean below the altimeter, and the altimeter output varies with antenna orientation. The error introduced into the altimeter data is modeled empirically, but close agreements with the expected errors was not realized. The attitude error effects expected with the GEOS-C altimeter are modelled using a form suggested by an analytical derivation. The treatment is restricted to the case of a relatively smooth sea, where the height of the ocean waves are small relative to the spatial length (pulse duration times speed of light) of the transmitted pulse. Author

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N75-19343 California Univ., Davis.
THRUST GENERATION BY CHARGED PARTICLE NEUTRAL GAS INTERACTION Ph.D. Thesis
Edward Alfred Christenson 1974 77 p
Avail: Univ. Microfilms Order No. 74-29295

A basic theoretical and experimental investigation of a thrust generating system utilizing charged particles in a neutral gas is presented. A one-dimensional, constant area analytical model with charged particles is considered. Explicit relations expressing performance are derived for this system. Experimental results qualitatively verify the validity of the theoretical expressions which indicate that it is technically feasible for the conversion efficiency of electrical energy to propulsive energy to approach unity. Particle radius and charge per unit mass are found to be the most decisive factors in determining performance. Multiple, successive stages of the system may be used to achieve suitable levels of thrust per unit area. Dissert. Abstr.

N75-19344*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Propulsion Div.
NOZZLE EXIT EXHAUST PRODUCTS FROM SPACE SHUTTLE BOOST VEHICLE (NOVEMBER 1973 DESIGN)
1 Feb. 1975 50 p refs
(Contract NAS7-100)
(NASA-CR-136747; JPL-TM-33-712) Avail: NTIS HC $3.75 CSCL 21H

Principal exhaust species emitted at various altitudes for two trajectories of the space shuttle vehicle are presented. The exhaust composition is given for the nozzle exit plane on the basis of equilibrium chemistry. Afterburning of excess H, H2, and CO in the plume is accounted for. Species considered include HCl and Al2O3, which have been recognized as environmentally significant, as well as others such as H2O (produced by both the solid rocket motor and the orbiter main engine) which, although innocuous, may participate in subsequent chemical reactions in the atmosphere. Author

N75-19345*# Battelle Columbus Labs., Ohio.
A STUDY TO IDENTIFY AND COMPARE AIRBORNE SYSTEMS FOR IN-SITU MEASUREMENTS OF LAUNCH VEHICLE EFFLUENTS
T. J. Thomas and A. S. Chace 31 Oct. 1974 111 p refs
(Contract NAS1-12971)
(NASA-CR-132577) Avail: NTIS HC $5.25 CSCL 21H

An in-situ system for monitoring the concentration of HCl, CO, CO2, and Al2O3 in the cloud of reaction products that form as a result of a launch of solid propellant launch vehicle is studied. A wide array of instrumentation and platforms are reviewed to yield the recommended system. An airborne system suited to monitoring pollution concentrations over urban areas for the purpose of calibrating remote sensors is then selected using a similar methodology to yield the optimal configuration. Author

N75-19346*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

DATA BOOK FOR 12.5-INCH DIAMETER SRB THERMAL MODEL WATER FLOTATION TEST; 1.29 psia, SERIES P022

Steve L. Allums Apr. 1974 220 p
(NASA-TM-X-70407; M-ASTN-74-4) Avail: NTIS HC $7.25 CSCL 21H

Data acquired from tests conducted to determine how thermal conditions affect SRB (Space Shuttle Solid Rocket Booster) flotation at a scaled pressure of 1.29 psia are presented. Included are acceleration, pressure, and temperature data recorded from initial water impact to final flotation position using a 12.5-inch diameter thermal model of the SRB. Nineteen valid tests were conducted. These thermal tests indicated the following basic differences relative to the ambient temperature and pressure model tests: (1) more water was taken on board during penetration and (2) model flotation/sinking was temperature sensitive.
Author

N75-19347*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

A THRUSTER SUB-SYSTEM MODULE (TSSM) FOR SOLAR ELECTRIC PROPULSION

G. Richard Sharp 1975 21 p refs Presented at 11 Elec. Propulsion Conf., New Orleans, 19-21 Mar. 1975; sponsored by AIAA
(NASA-TM-X-71683; E-8276) Avail: NTIS HC $3.25 CSCL 21C

Solar Electric Propulsion (SEP) is currently being studied for possible use in a number of near-earth and planetary missions. Thruster systems for these missions could be integrated directly into a spacecraft or modularized into a Thruster Sub-System Module (TSSM). A TSSM for electric propulsion missions would consist of a 30-cm ion thruster, thruster gimbal system, propellant storage and feed system, associated Power Processing Unit (PPU), thermal control system and complete supporting structure. The TSSM would be wholly self-contained and be essentially a plug-in or strap-on electric stage with simple mechanical, thermal, electrical and propellant interfaces. The TSSM described in this report is designed for a broad range of missions requiring from two to ten TSSM's mounted in a 2 by x configuration. The thermal control system is designed to accommodate waste heat from the power processor based on realistic efficiencies when the TSSM is operating from 0.7 to 3.5 AU's. The modules are 0.61 M (2 ft) wide by 2.29 M (7.5 ft) long and have a dry weight including propellant tank of 54.4 kg (120 lb). The propellant tank will hold 145.1 kg (320 lb) of mercury.
Author

N75-19348*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

A STRUCTURAL AND THERMAL PACKAGING APPROACH FOR POWER PROCESSING UNITS FOR 30-cm 10N THRUSTERS

J. E. Maloy and G. R. Sharp 1975 29 p refs Presented at 11th Elec. Propulsion Conf., New Orleans, 19-21 Mar. 1975; sponsored by AIAA
(NASA-TM-X-71686; E-8282) Avail: NTIS HC $3.75 CSCL 21C

Solar Electric Propulsion (SEP) is currently being studied for possible use in a number of near earth and planetary missions. The thruster subsystem for these missions would consist of 30 centimeter ion thrusters with Power Processor Units (PPU) clustered in assemblies of from two to ten units. A preliminary design study of the electronic packaging of the PPU has been completed at Lewis Research Center of NASA. This study evaluates designs meeting the competing requirements of low system weight and overall mission flexibility. These requirements are evaluated regarding structural and thermal design, electrical efficiency, and integration of the electrical circuits into a functional PPU layout.
Author

N75-19349*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THERMAL ANALYTIC MODEL OF 30 cm ENGINEERING MODEL MERCURY ION THRUSTER

Jon C. Oglebay 1975 16 p refs Presented at the 11th Elec. Propulsion Conf., New Orleans, 19-21 Mar. 1975; sponsored by AIAA
(NASA-TM-X-71680) Avail: NTIS HC $3.25 CSCL 21C

A lumped parameter thermal nodal network was developed for a 30 cm Engineering Model Mercury Ion Thruster. The network consists of approximately 100 nodes coded in SINDA format for use on the Univac 1106/1108 computer. This model takes into account internal dissipation, radiation, and conduction as well as environmental heating. A series of tests were performed to simulate a wide range of thermal environments on an operating 30 cm thruster, instrumented to measure the temperature distribution within the thruster. The results of these tests were used to calibrate the analytical model. The analytical model along with comparisons between analytical and experimental results for the various operating conditions are presented.
Author

N75-19350*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SOLUTIONS FOR DISCHARGE CHAMBER SPUTTERING AND ANODE DEPOSIT SPALLING IN SMALL MERCURY ION THRUSTERS

John L. Power and Donna J. Hiznay 1975 74 p Presented at the 11th Elec. Propulsion Conf., New Orleans, 19-21 Mar. 1975; Sponsored by AIAA
(NASA-TM-X-71675; AIAA-75-399) Avail: NTIS HC $4.25 CSCL 21C

Proposed solutions to the problems of sputter erosion and sputtered material spalling in the discharge chamber of small mercury ion thrusters are presented. The accelerated life test evaluated three such proposed solutions: (1) the use of tantalum as a single low sputter yield material for the exposed surfaces of the discharge chamber components subject to sputtering, (2) the use of a severely roughened anode surface to improve the adhesion of the sputter-deposited coating, and (3) the use of a wire cloth anode surface in order to limit the size of any coating flakes which might spall from it. Because of the promising results obtained in the accelerated life test with anode surfaces roughened by grit-blasting, experiments were carried out to optimize the grit-blasting procedure. The experimental results and an optimal grit-blasting procedure are presented.
Author

N75-19351*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

AN ANALYSIS OF SPACE ENVIRONMENT EFFECTS ON PERFORMANCE AND MISSIONS OF A SOLAR ELECTRIC PROPULSION STAGE (SEPS)

Dave M. McGlathery 17 Feb. 1975 98 p refs
(NASA-TM-X-64917) Avail: NTIS HC $4.75 CSCL 21C

The development of an analysis which addresses the problems of degrading space environmental effects on the performance and missions of a Solar Electric Propulsion Stage (SEPS) is reported. A detailed study concerning the degrading effects of the Van Allen Belt charged-particle radiation on specific spacecraft subsystems is included, along with some of the thermal problems caused by electromagnetic radiation from the sun. The analytical methods used require the integration of two distinct analyses. The first, is a low-thrust trajectory analysis which uses analytical approximations to optimum steering for orbit raising, including three-dimensional plane change cases. The second is the conversion of the Vette time-averaged differential energy spectra for protons and electrons into a 1-MeV electron equivalent environment as a function of spatial position and thickness of various shielding materials and solar-cell cover slides.
Author

N75-19352# National Aerospace Lab., Tokyo (Japan).

PRESSURE HISTORIES OF SPINNING SOLID PROPELLANT ROCKET MOTORS

Takashi Niioka, Shinichi Ishii, and Tohru Mitani Jun. 1974 25 p refs In JAPANESE; ENGLISH summary
(NAL-TR-372) Avail: NTIS HC $3.25

The burning pressure - time diagrams were predicted and measured for spinning solid propellant rocket engines. The propellant was in the internal burning star configuration. To predict pressure histories, the acceleration induced and orientation dependent burning rate augmentation data of a solid propellant from slab motor tests were entered into a grain regression program. Composite propellants were tested at spin rates of 0 to 870 rpm. Additional tests of spinning solid propellant rocket engines were conducted in an altitude simulation facility. The

measured time histories were compared with the data obtained in the test situation. Author

N75-19353*# Aerojet Solid Propulsion Co., Sacramento, Calif.
DEMONSTRATION OF A STERILIZABLE SOLID ROCKET MOTOR SYSTEM Final Report
E. J. Mastrolia, G. M. Santerre, and W. L. Lambert Washington NASA Feb. 1975 202 p refs
(Contract NAS1-10861)
(NASA-CR-2478) Avail: NTIS HC $7.25 CSCL 21H

A solid propellant rocket motor containing 60.9 Kg (134-lb) of propellant was successfully static fired after being subjected to eight heat sterilization cycles (three 54-hour cycles plus five 40-hour cycles) at 125 C (257 F). The test motor, a modified SVM-3 chamber, incorporated a flexible grain retention system of EPR rubber to relieve thermal shrinkage stresses. The propellant used in the motor was ANB-3438, and 84 wt% solids system (18 wt% aluminum) containing 66 wt% stabilized ammonium perchlorate oxidizer and a saturated hydroxylterminated polybutadiene binder. Bonding of the propellant to the EPR insulation (GenGard V-4030) was provided by the use of SD-886, an epoxy urethane restriction. Author

N75-19354# General Electric Co., Philadelphia, Pa. Space Div.
MULTI-HUNDRED WATT RADIOISOTOPE THERMOELECTRIC GENERATOR PROGRAM, PART 1 Annual Report, 1 Jan. - 31 Dec. 1973
1973 310 p refs
(Contract AT(29-2)-2831)
(GESP-7107-Pt-1; GEMS-418-Pt-1) Avail: NTIS HC $9.25

Significant events, activities, and achievements during 1973 in the MHW-RTG Program for developing RTG's for space missions are summarized. During the year full-scale qualification and flight hardware and ground support equipment were fabricated and tested. Preliminary tests in the safety program are reported. Radiological protection and safety analysis reports were issued. Performance requirements were developed from systems analyses and test data. In this volume, information is included on the safety analyses and tests, the RTG system, heat source design, fuel form, fuel capsule, fuel sphere assembly and associated hardware, gas management subsystem, and analysis and testing of the heat source assembly. NSA

N75-19355# General Electric Co., Philadelphia, Pa. Space Div.
MULTI-HUNDRED WATT RADIOISOTOPE THERMOELECTRIC GENERATOR PROGRAM, PART 2 Annual Report, 1 Jan. - 31 Dec. 1973
1973 349 p
(Contract AT(29-2)-2831)
(GESP-7107-Pt-2; GEMS-418-Pt-2) Avail: NTIS HC $9.50

Significant events, activities, and achievements during 1973 in the MHW-RTG program for developing RTG's for space missions are summarized. During the year full-scale qualification and flight hardware and ground support equipment were fabricated and tested. In this volume, information is included on converter design, development, and performance testing, product assurance, converter fabrication, acceptance and qualification testing, and ground support equipment such as the electric heat source, power supplies, and shipping and storage containers and handling equipment for the RTG. NSA

N75-19356# ARO, Inc., Arnold Air Force Station, Tenn.
PERFORMANCE OF A UTC FW-4S SOLID PROPELLANT ROCKET MOTOR UNDER THE COMMAND EFFECTS OF SIMULATED ALTITUDE AND ROTATIONAL SPIN Final Report
H. L. Merryman and L. R. Smith Dec. 1974 41 p refs
Sponsored by NASA and AEDC
(ARO Proj. RA301)
(AD-A002149; AEDC-TR-74-83) Avail: NTIS CSCL 21/8

One United Technology Center FW-4S solid-propellant rocket motor was fired at an average simulated altitude of 103,000 ft while spinning about its axial centerline at 180 rpm. The objectives of the test program were to determine motor altitude ballistic performance including the measurement of the nonaxial thrust vector and to demonstrate structural integrity of the motor case and nozzle. These objectives are presented and discussed. GRA

N75-19357# Utah Univ., Salt Lake City. Microwave Device and Physical Electronics Lab.
ROCKET CHAMBER TEMPERATURE MEASUREMENTS BY MICROWAVE TECHNIQUES Final Report, 1 Oct. 1970 - 31 Mar. 1974
James L. Hou and Richard W. Grow 1 Jul. 1974 157 p refs
Sponsored in part by DOD
(Contract F44620-68-C-0022)
(AD-A002245; UTEC-MD-74-055) Avail: NTIS CSCL 21/8

Microwave attenuation techniques are used to find the combustion chamber temperature of a solid rocket motor, and the predicted value calculated by a theoretical specific impulse computer program and the value calculated with the microwave measurements agree within three percent. The propellants used in this investigation were seeded with five percent potassium perchlorate by weight to furnish enough electrons in the plasma to cause measurable attenuation. The propellants were also seeded with 5 to 10 percent aluminum to produce suspended metallic particles in the plasma. The temperature profile inside the combustion chamber is determined for a distance of two inches away from the burning surface by scanning the focused microwave signal transverse to the combustion chamber and by using the motion of the burning surface with respect to the antennas. GRA

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N75-19358+ Paris-Val de Marne Univ., Creteil (France). Lab. d'Energetique Biochimique.
STUDY OF EXCHANGE AND TRANSPORT PROPERTIES OF ELECTRON TRANSPORT CHAIN REDOX COUPLE MEMBRANES OR THEIR MODELS Final Report [ETUDE DES PROPRIETES D'ECHANGE ET DE TRANSPORT DE MEMBRANES CONSTITUEES DE COUPLES REDOX DE LA CHAINE DE TRANSPORT D'ELECTRONS OU DE MODELES DE CEUX-CI COMPTE-RENDU DE FIN DE CONTRAT]
R. Buvet and L. T. Yu Jan. 1974 30 p refs In FRENCH; ENGLISH summary
(Contract DGRST-71-7-3179)
Avail: NTIS HC $3.75

As biological membrane model, thick membranes (50-300 microns) were obtained by including insoluble redox exchangers in a polymeric phase constituted by copolymers of polyvinyl chloride and polyvinyl acetate. Insoluble redox exchangers utilized were: polyimino quinone, polypyrrole, phtalocyanins, and insoluble quinones. The results show that polypyrrole and polyiminoquinone membrane have: (1) reversible redox exchanger properties (oxidizing capacity is 1,5 meg/g of dry membrane); and (2) acid exchange properties (acidity absorption is 1 meg/g of dry membrane when the membrane is immersed in normal acidic aqueous solution). The polyimino quinone membrane have anionic permselective properties. These properties are dependent on the redox state of the material. Bimolecular layer membranes sandwiched by two nonmiscible aqueous phases constituted by ternary system water-polyoxyethylen glycol-ammonium sulphate were studied to avoid slow kinetic phenomena inherent in thick membranes. Author (ESRO)

N75-19359*# Ultrasystems, Inc., Irvine, Calif.
CROSSLINKING AND DEGRADATION MECHANISMS IN MODEL SEALANT CANDIDATES Annual Report, 26 Nov. 1973 - 16 Sep. 1974
K. L. Paciorek, J. Kaufman, and R. H. Kratzer Sep. 1974 49 p refs
(Contract NAS2-7981)
(NASA-CR-137636; SN-8249-A1; AR-1) Avail: NTIS HC $3.75 CSCL 11A

Heterocyclic ring systems were investigated, triazines and 1,2,4-oxadiazoles. Only a limited effort was extended to the

preparation of triazoles. Compounds, n-perfluoroheptyl-s-triazine, a perfluoroether substituted triazine, [C3F7OCF(CF3)CF2OCF-(CF3)] 3C3N3,1,4-bus [(5-perfluoro-n-heptyl)-1,2,4-oxadiazolyl]-benzene, its perfluoroalkylether substituted analogue, and 3,5-bis(perfluoro-n-heptyl)-1,2,4-oxadiazole were synthesized and characterized. To eliminate the effect due to a tertiary fluorine present in branched materials, the pure n-alkyl-compounds were prepared. The main starting material, perfluoro-n-octanonitrile, was obtained from commercially available perfluoro-n-octanoic acid via a three step synthesis. Author

N75-19360*# Kanner (Leo) Associates, Redwood City, Calif.
THE PREPARATION OF SILICA AEROGELS FROM METHYLORTHOSILICATE IN AN ALCOHOLIC MEDIUM AND THEIR PROPERTIES
G. A. Nicolaon and S. J. Teichner Washington NASA Apr. 1975 16 p refs Transl. into ENGLISH from Bull. Soc. Chim. France (Masson), no. 5, 1968 p 1906-1911
(Contract NASw-2481)
(NASA-TT-F-16216) Avail: NTIS HC $3.25 CSCL 07C

A silica aerogel is prepared by hydrolysis in an autoclave of methyl orthosilicate in methanolic solution. The alcohol is removed when its critical temperature is exceeded. An advantage of this method over the usual method of preparing aerogels in an initially aqueous medium is that it does not require a change of solvent before the autoclave treatment and requires no handling of the gel while it is still impregnated with alcohol and is thus mechanically fragile. Extremely high-porosity silica aerogels are obtained by this method. Author

N75-19361# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
STRUCTURE, TRANSPORT PROPERTIES, DEFORMATION, AND RADIATION EFFECTS ON METALS AND CERAMICS
Annual Progress Report, period ending 30 Jun. 1974
S. Peterson, comp. Oct. 1974 89 p refs
(Contract W-7405-eng-26)
(ORNL-4970) Avail: NTIS HC $4.75

Research progress is reported on structure of materials, X-ray diffraction, fundamental ceramics, crystal physics, surface phenomena, physical properties of materials, properties of superconductors, mechanical properties of materials, and radiation effects on materials. NSA

N75-19362# Sandia Labs., Albuquerque, N.Mex.
ORGANIC HYDROGEN GETTERS
R. L. Courtney, L. A. Harrah, and D. R. Anderson 1974 14 p Sponsored by ERDA
(SLA-74-5337; Conf-740227-1) Avail: NTIS HC $3.25

The development of an unsaturated organic-catalyst combination that is capable of reacting with molecular hydrogen to produce an inert saturated organic compound is reported. NSA

N75-19363# Air Force Academy, Colo.
PERCENT BODY WATER MEASUREMENT USING IN VIVO D2O DILUTION AND DEUTRON PHOTODISINTEGRATION
Preliminary Report, 1 Sep. 1973 - 31 Jul. 1974
Anthony K. Hyder, Marion J. Stansell, and John T. Caldwell Aug. 1974 13 p refs
(AF Proj. 7903)
(AD-A001935; SRL-TR-74-0019; USAFA-TR-74-16) Avail: NTIS CSCL 06/1

The measurements of percent body water, lean body mass, and body fat are generally associated with technical difficulties, safety limitations, and inherent accuracies. Using D2O dilution for this purpose is comparatively safe but has, in the past required quantification by relatively insensitive and laborious methods. A promising new approach to quantifying D2O in serum samples is based on the photodisintegration of the deuteron, in which a high energy gamma ray initiates the breakup of a deuterium nucleus into a proton and a neutron. The proton is stopped in the serum sample and is not detected. The emitted neutron, with higher probability of escape, is detected by standard procedures. The technique is amenable to automation, low D2O doses, and permits determination of percent body water, lean body mass, and body fat at even lowest echelon medical facilities. GRA

24 COMPOSITE MATERIALS

Includes laminates.

N75-19364 Tennessee Univ., Knoxville.
ON THE FRACTURE TOUGHNESS OF COMPOSITE MATERIALS Ph.D. Thesis
Frances Antonio Iannuzzi 1974 190 p
Avail: Univ. Microfilms Order No. 74-27210

It is suggested, and experimentally demonstrated for a boron-aluminum composite, that a lower bound for the stress intensity factor can be evaluated by using the composite strength and the effective critical crack at fracture in the expression from linear elastic fracture mechanics for a penny-shaped crack. A fracture mechanics study was conducted on double-edge-notched carbon-epoxy and center-notched boron-aluminum composite specimens. Observations concerning the secondary effects of width, volume fraction of reinforcing fibers, thickness, fiber orientation, fiber diameter, and temperature on the fracture behavior are reported. The applicability of the linear elastic fracture mechanics expressions utilized was established and appropriate modifications of these expressions are suggested. The load at which a crack started to grow and the load at which the specimens fractured catastrophically were measured, and observations concerning the fracture mode are reported. The critical crack length necessary to initiate catastrophic fracture was determined and the critical stress intensity factors were obtained. Dissert. Abstr.

N75-19365 Pennsylvania State Univ., University Park.
STRENGTH AND FRACTURE TOUGHNESS OF BINARY ALKALI SILICATE GLASSES Ph.D. Thesis
Christopher Robin Kennedy 1974 104 p
Avail: Univ. Microfilms Order No. 74-28965

The strength, modulus of elasticity, fracture surface energy, and their relationship were investigated for a series of alkali silicate glasses and commercially fused silica. The strengths and fracture surface energies decreased with increasing silica content in all systems, even though the moduli of elasticity exhibited different trends. The strengths varied in an approximately linear manner with the fracture toughness. No quantitative relationship between the fracture surface energies and the amounts of flow as measured by the microhardnesses was found to exist. Further, the fracture surface energies were not related to the elastic moduli. Flaw sizes calculated for annealed glasses were shown to be related to the sizes of the separated microphase observed by transmission electron microscopy. The flaw sizes for the abraded alkali silicate glasses were shown to be inversely related to the fracture surface energies. Dissert. Abstr.

N75-19366*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PERFORMANCE OF GRAPHITE FIBER-REINFORCED POLYIMIDE COMPOSITES IN SELF-ALIGNING PLAIN BEARINGS TO 315 C
H. E. Sliney and T. P. Jacobson 1975 15 p refs Proposed for presentation at Ann. Conf. of Am. Soc. of Lubrication Engr., Atlanta, 29 Apr. - 2 May 1975
(NASA-TM-X-71667; E-8255) Avail: NTIS HC $3.25 CSCL 11D

A 50/50 (weight percent) composite of graphite fibers and polyimide was studied in self-aligning plain bearings oscillating + or - 15 degrees at 1 hz. The friction coefficient was 0.15 + or - 0.05 at 250 C, and 0.05 + or - 0.02 at 315 C. Best results were obtained with a molded composite liner with chopped graphite fibers randomly oriented in the composite. The specific wear rate is given. It was found that the dynamic unit load capacity was higher for a composite bushing (thin liner), than for a composite ball. Author

N75-19367*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PROCESSABLE HIGH TEMPERATURE RESISTANT POLYMER MATRIX MATERIALS
Tito T. Serafini 1975 20 p refs Presented at Intern. Conf. on Composite Mater., Geneva, 7-11 Apr. 1975
(NASA-TM-X-71682; E-7324) Avail: NTIS HC $3.25 CSCL 11D

Studies conducted with addition-type polyimides are reviewed with emphasis on the development of the Polymerization of Monomer Reactants (PMR) approach, in which PMR occurs on the surface of the reinforcing fibers. Author

N75-19368*# Texas A&M Univ., College Station. Dept. of Mechanical Engineering.
INVESTIGATION OF FATIGUE STRENGTH OF MULTILAYER ADVANCED FIBER COMPOSITES
H. R. Thornton and T. J. Kozik Sep. 1974 79 p refs
(Grant NGR-44-001-149)
(NASA-CR-134691; TEES-2992-74-002) Avail: NTIS HC $4.75 CSCL 11D

The analytical characterization of a multilayer fiber composite plate (without hole) was accomplished for both static and dynamic loading conditions using the finite difference technique. Thornel 300/5208 composites with and without holes were subjected to static and tensile fatigue testing. Five (5) fiber orientations were submitted to test. Tensile fatigue testing also included three (3) loading conditions and two (2) frequencies. The low-cycle test specimens demonstrated a shorter tensile fatigue life than the high-cycle test specimens. Failure surfaces demonstrated effect of testing conditions. Secondary failure mechanisms, such as: delamination, fiber breakage, and edge fiber delamination were present. Longitudinal delamination between plies also occurred in these specimens. Author

N75-19369# Materials Research Labs., Maribyrnong (Australia).
THE RAPID FAILURE OF PVC FANS: THREE CASE STUDIES
G. F. Sansom Nov. 1974 23 p refs
(MRL-TN-359) Avail: NTIS HC $3.25

Rigid poly(vinyl chloride), PVC, is widely used in the manufacture of fans and ventilation equipment for use in environments where corrosive vapors make the use of metals undesirable. The rapid failure of three fans was studied together with the behavior and characteristics of rigid PVC. The investigations indicate that although the characteristics of the PVC contributed to the final failures, in each case the prime cause of failure involved either inadequate installation and/or maintenance inspection. Recommendations for techniques to be applied in inspecting PVC ventilation equipment and safety precautions which should be considered with such installations are described. Author

N75-19370# Purdue Univ., Lafayette, Ind. Composite Materials Lab.
OPTIMIZATION OF BUCKLING AND YIELD STRENGTHS OF LAMINATED COMPOSITES
C. C. Chao, S. L. Koh, and C. T. Sun May 1974 33 p refs
Backup document for AIAA Synoptic scheduled for publication in the AIAA Journal in Aug. 1975
(Contract DAHC04-71-C-0020)
(TR-74-1) Avail: NTIS HC $3.75

Optimum fiber orientations in a laminated plate under a set of combined in-plane loadings were investigated according to the buckling and yielding strengths. The laminate was assumed to have symmetric angle-ply layups. A direct search technique was employed to solve the optimization problems. A marginal size of the laminate is also established. For a plate larger than this size, the laminate is to be optimized according to the buckling criterion. On the other hand, if the plate is smaller than the marginal size, then the yield strength criterion should be followed. Author

N75-19371# Carnegie-Mellon Univ., Pittsburgh, Pa.
GENERALIZATION OF INTERNAL CENTRIFUGAL ZONE GROWTH OF METAL-CERAMIC COMPOSITES: ONE DIMENSIONAL MODEL
R. F. Sekerka and R. A. Hartzell Aug. 1974 63 p
(Contract AT(11-1)-2407)
(COO-2407-2) Avail: NTIS HC $4.25

The electric and temperature fields within inductively heated materials is calculated to study the crystal growth process called Internal Centrifugal Zone Growth. A complicated two-dimensional problem is studied via a simple one-dimensional model that applies to infinitely long samples heated by infinitely long induction coils. Two one-dimensional models are presented. NSA

N75-19372# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mechanical Engineering.
EXPLORATORY DEVELOPMENT ON FRACTURE MECHANICS OF COMPOSITE MATERIALS Final Report, 15 Mar. 1973 - 15 Mar. 1974
Thomas A. Cruse and Jon R. Osias Apr. 1974 159 p refs
(Contract F33615-73-C-5055; AF Proj. 7340)
(AD-A001609; SM-74-2; AFML-TR-74-111) Avail: NTIS CSCL 11/4

An extended experimental and analytical study of linear elastic fracture mechanics for graphite/epoxy advanced composite laminates is reported herein. The experimental program successfully addresses three topics: the existence of valid fracture toughness testing of composites; the hypothesis that angle-ply fracture strength is governed by fiber tensile strength; and, the fracture strengths of angle-ply laminates can be correlated on the basis of a critical strain energy release rate model. Two independent test specimen geometries are used to show that valid fracture strengths can be obtained, subject to discussed size constraints for specimen geometries. The analytical study makes use of a previously reported stress analysis method for crack tip stress intensity factors using a special form of the boundary-integral equation method. The problems of center notched tensile loaded plates with edge cracks emanating from the notch edges are analyzed in detail. A possible correlation of two strength models for notched laminates is reported. GRA

N75-19373# Virginia Polytechnic Inst. and State Univ., Blacksburg. Coll. of Engineering.
A RESPONSE SURFACE FOR THE COMPLEX MODULUS OF COMPOSITE MATERIALS Technical Report, 1 Jul. 1972 - 30 Apr. 1974
Charles E. Arthur, Agnes S. Heller, and Ashok B. Thakker 30 Oct. 1974 68 p refs
(Contract F33615-72-C-2111; AF Proj. 7340)
(AD-A001978; AFML-TR-74-185) Avail: NTIS CSCL 11/4

The complex modulus of boron/epoxy and graphite/epoxy laminates was measured in forced vibration tests at frequencies ranging from 20 to 17,000 Hz and temperatures varied between -50 and +300F. The data was analyzed using response surface methodology. Based on the response surface time-temperature shift parameters, master curves, and probability relations were developed. GRA

N75-19374# Washington Univ., St. Louis, Mo. Materials Research Lab.
EXPLORATORY DEVELOPMENT OF BASIC FAILURE BEHAVIOR OF ANISOTROPIC POLYMERIC MATERIAL Final Report, 1 May 1972 - 15 Jan. 1973
Edward M. Wu Apr. 1974 36 p refs
(Contract F33615-72-C-1514)
(AD-A002134; AFML-TR-74-77) Avail: NTIS CSCL 11/4

Crack extension in laminated composite has been analyzed by stress analysis of the crack through classical laminated plate analysis. Through such stress analysis, the stress vector acting on the periphery of a critical volume encapsulating the crack tip is obtained. This stress vector is compared to the strength vector which is independently determined by the tensor polynomial failure criterion. The comparison is made through polar representation of the stress and strength vector from the crack tip. Experimental results on a variety of lamination geometry and crack orientations supported the hypotheses that the coincidence of the stress and strength vector determine the crack propagation trajectory. GRA

N75-19375# United Aircraft Corp., Stratford, Conn. Sikorsky Aircraft Div.
FATIGUE DAMAGE BEHAVIOR IN COMPOSITE MATERIALS Interim Report, Jun. 1973 - Jul. 1974
Joseph J. Nevadunsky, Michael J. Salkind, and John J. Lucas

Sep. 1974 45 p refs
(Contract F44620-73-C-0043; AF Proj. 9782)
(AD-A001944; SER-50889; AFOSR-74-1791TR) Avail: NTIS CSCL 11/4

Detection of early fatigue damage in composite materials by nondestructive inspection (NDI) techniques has been demonstrated for plus or minus 45 degrees Glass/Epoxy, and plus or minus 45 degrees/0 degrees Graphite/Glass/Epoxy. Dynamic axial modulus and temperature were monitored continuously with a correlation between temperature rise and modulus decrease observed. The modulus decrease and temperature rise are indicative of irreversible damage in these materials. This is validated by observation of a rapid restoration of elevated temperature after reloading specimens which had been stopped and had cooled to ambient temperature. Torsional modulus measurements and coin tap tests were performed at 0, 1,000,000, 5 x 1,000,000, and 10 to the 7th power cycles, on all fatigue specimens. Other NDI procedures including holographic interferometry, ultrasonics, penetrant, and X-ray radiography were performed on two specimens of each material to evaluate their effectiveness in detecting fatigue damage. GRA

N75-19376# Army Materials and Mechanics Research Center, Watertown, Mass.
IMPACT DAMAGE TOLERANCE OF GRAPHITE/EPOXY SANDWICH PANELS Final Report
John M. Slepetz, Donald W. Oplinger, Burton S. Parker, and Robert T. Tremblay Sep. 1974 29 p refs Presented at the Natl. SAMPE Symp. and Exhibition, 19th, Buena Vista, Calif., 23-25 Apr. 1974
(DA Proj. 1X1-63292-D-156)
(AD-A002064; AMMRC-TR-74-20) Avail: NTIS CSCL 11/4

An exploratory study of the damage susceptibility of graphite/epoxy sandwich materials was carried out. An analysis of a sandwich panel indented by a rigid sphere was conducted to determine the stresses and deformations, and to determine the effect of various panel stiffness parameters on energy absorption during impact. Falling-weight impact tests were performed on 122 rectangular sandwich panels. Various material, geometry, and loading parameters were investigated. Impact damage was related to residual strength of specimens taken from the damaged region. Sandwich panels used in the impact tests were fabricated with face sheets of graphite or S-glass/epoxy and Nomex phenolic honeycomb core. Impact tests showed that graphite sandwich panels are less damage resistant than S-glass panels. An order of magnitude higher energy level was required to sustain the same relative damage level in S-glass as in graphite panels. GRA

N75-19377# Kaman Sciences Corp., Colorado Springs, Colo.
STRESS WAVE CHARACTERIZATION OF AVCO 3D CARBON-CARBON (3DCC), VOLUME 1 Final Report, 22 May 1972 - 30 Jun. 1974
Bobby L. Bracewell, Thomas F. V. Meagher, and James C. Nickell 20 May 1974 82 p refs
(Contract DNA001-72-C-0202; DNA Proj. NWED-N99QAXA)
(AD-A001003; DNA-3424-1) Avail: NTIS CSCL 11/4

The shock wave characteristics of an AVCO three-dimensional weave, carbon-carbon material (AVCO 3DCC) were experimentally investigated and analytically modeled. Using the gas gun facility, Hugoniot and wave attenuation tests were performed on flat specimens cut from arcs of the material. From these tests, equation-of-state inputs for use with the PUFF computer code were derived and used to make correlations with the wave attenuation experiments. Explanation of the 3DCC material behavior is given based upon the degree of correlation between the calculations and experiments. Author (GRA)

N75-19305 Battelle Inst., Frankfurt am Main (West Germany).
MANUFACTURING OF COMPOSITE MATERIALS IN SPACE
K. H. Gruenthaler and D. Sethna *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 211-217 refs (For availability see N75-19285 11-12)

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

N75-19378 Stanford Univ., Calif.
LOW TEMPERATURE HEAT CAPACITIES OF OPEN-STRUCTURED CRYSTALS Ph.D. Thesis
Necmi Bilir 1974 103 p
Avail: Univ. Microfilms Order No. 74-26988

The low temperature heat capacity of alpha-cristobalite, a tetragonal crystalline form of silica, was measured between 2 deg and 20 deg Kelvin by adiabatic pulse and thermal relaxation techniques, using both silicon temperature detectors and thermocouples. Alpha-cristobalite was prepared by thermal devitrification of vireous silica at high temperatures for extended periods of time. The results show that there is a large positive deviation from the normal Debye behavior, with a peak around 13 deg Kelvin. This kind of excess heat capacity was previously believed to be peculiar to amorphous or glassy solids, but the X-ray diffraction patterns of the test samples showed no amorphous background indicating that this type of behavior is a property of low coordination number structures. A semi-empirical model, in terms of a combination of the Einstein and Debye models, was proposed, and a very good agreement was obtained between the experimental values and the calculated values using the proposed model. Dissert. Abstr.

N75-19379 North Carolina Univ., Chapel Hill.
PATTERN RECOGNITION, FACTOR ANALYSIS, AND INFORMATION THEORY APPLIED TO MASS SPECTRA Ph.D. Thesis
Joseph Bruce Justice, Jr. 1974 136 p
Avail: Univ. Microfilms Order No. 74-26890

Several different approaches to the analysis of chemical data are examined. The first chapter describes the application of pattern recognition methods to the interpretation of mass spectra. Chapter 2 examines the same data set from a factor analysis point of view, while the third chapter is concerned with the uses to which information theory may be put in mass spectroscopy. The determination of functional group presence by pattern recognition on the mass spectrum of a compound is examined. Calculation of the mean vectors of the classes, the complex mean of the classes, the nearest neighbor method, and the learning machine method are reported. The third chapter is an examination of the way in which the concepts of information theory can be applied to data analysis, mass spectroscopy in particular. Chapter 4 is an examination of the selection of a set of optimal gas chromatographic stationary phases. The optimization criterion was the spanning of the properties of 226 stationary phases. The nearest neighbor method was used to establish similarity in the space. Dissert. Abstr.

N75-19380*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
METHOD OF GROWING COMPOSITES OF THE TYPE EXHIBITING THE SORET EFFECT Patent Application
Biliyar N. Bhat, inventor (to NASA) (NRC) Filed 11 Mar. 1975 17 p Sponsored by NASA
(NASA-Case-MFS-22926-1; US-Patent-Appl-SN-557565) Avail: NTIS HC $3.25 CSCL 20B

A method is described to improve the structure and homogeneity of eutectic materials and single crystals. A predetermined amount of segregation is introduced into a molten sample of a composite that exhibits the Soret effect, such amount approximating the amount of segregation resulting from directional solidification of the sample. The molten sample is then directionally solidified starting at the end opposite the end richer in the constituent that would migrate toward the cooler part of a liquid solution of the composite maintained in a temperature gradient. Since solidification commences at the end deficient in such constituent, its migration toward the interface between the solid and liquid during the solidification will

compensate for the deficiency. A homogeneous solidification product that is well suited to the production of high temperature eutectic composites, fiber optic strands, and electronic materials is produced. NASA

N75-19381# Royal Aircraft Establishment, Farnborough (England).
THERMAL OF OXIDATIVE DEGRADATION AND STABILIZATION OF POLYEPICHLOROHYDRIN VULCANIZATES
Y. Nakamura, K. Mori, and S. Oka Dec. 1974 19 p refs Transl. into ENGLISH from J. Rubber Ind. Jap. (Japan), v. 47, no. 1, 1974 p 84-90
(RAE-Lib-Trans-1810; BR46354) Avail: NTIS HC $3.25

Five vulcanizing agents, trithio cyanuric acid/MgO/diphenyl guanidine (I), 2-mercaptoimid azoline/PB304 (II), hexamethylene diamine carbamate/PB304 (III), 2-dibutylamino 4, 6-dimercapto-s-triazine/MgO (IV), and 2-mercaptoimid azoline/PbS/S/MgO (V) were used to crosslink polyepichloro hydrin. The heat aging resistance of vulcanizates was studied in regard to the degree of crosslinking, gel fraction, and the volume of oxygen absorbed at 175 C. From these results as well as the retention of mechanical properties after an air oven aging test at 160 C, the thermal stability of the vulcanizates was found to increase in the order (III) less than (II) less than (V) less than (IV) less than (I). Thermal-oxidative degradation mechanisms are discussed of the four types of crosslink, thio-s-triazine, monosulphide, bisaminoalkyl, or polysulphide formed by the vulcanizing agents, (I, IV), (II), (III), or (V) respectively. The vulcanizates were stabilized by the addition of antioxidants such as nickel dibutyl dithocarbamate, 2-mercapto benzimidazole or phenyl-beta-naphthylamine. Author

N75-19382# Materials Research Labs., Maribyrnong (Australia).
TRACE ANALYSIS OF HEAVY METALS IN THE MARINE ENVIRONMENT
R. W. Pettis and A. T. Phillip Dec. 1974 38 p refs
(Rept-619) Avail: NTIS HC $3.75

A review is presented of recent literature in the field of trace metal analysis in the marine environment. The subject matter deals with (1) sampling procedures for sea water, sediments, and marine organisms; (2) sample pretreatment prior to analysis; (3) standard reference materials; and (4) modern analytical techniques for trace analysis, including atomic absorption spectrophotometry, anodic stripping voltammetry, and neutron activation analysis. Recent values are given for trace metal concentrations in a variety of samples obtained by workers in many regions of the world. Author

N75-19383# Council for Scientific and Industrial Research, Pretoria (South Africa).
THE MECHANISM OF THE ACCELERATING ACTION OF HYDROGEN SULPHIDE IN THE REACTION OF HYDROGEN ION DISCHARGE ON IRON
Z. A. Iofa and Fan Lyong Kam 1975 10 p refs Transl. into ENGLISH from Zashch. Metal. (USSR), v. 10, no. 1, 1974 p 17-21
(CSIR-Trans-1181) Avail: NTIS HC $3.25

The possible explanations of the stimulating action of hydrogen sulfide on the cathodic discharge of hydrogen on iron are discussed. The results of polarization and capacitance measurements carried out on a stationary and a revolving electrode are presented. Concordance of the experimental data with the assumed catalytic mechanism of the accelerating action of hydrogen sulfide on the discharge of hydrogen ions is demonstrated. Author

N75-19384# Council for Scientific and Industrial Research, Pretoria (South Africa).
THE THERMOELECTRIC PROPERTIES OF MELTS OF THE AgCl - AgBr AND AgCl - Ag2SO4 SYSTEMS
B. F. Markov, E. B. Kuzjakin, and V. Ja. Lojcenko 1974 4 p refs Transl. into ENGLISH from Ukr. Khim. Zh. (Ukrainian SSR) v. 38, 1972 p 1064-1065
(CSIR-Trans-1179) Avail: NTIS HC $3.25

The thermoelectromotive force method was employed to study (1) the thermoelectric properties of a molten AgCl - AgBr and an AgCl - Ag2SO4 mixture in order to disclose the influence of the substitution of the anion in the Cl(=), Br(-), I(-), SO4(2-) sequence, (2) the nature of the relation between the thermopotential and composition, and (3) the interrelationship of that relation with the character of the reactions occurring between the components of the mixture. Author

N75-19385# Council for Scientific and Industrial Research, Pretoria (South Africa).
PARTICLE SIZE ANALYSIS, DESCRIPTION AND ANALYSIS OF PARTICLE SIZE DISTRIBUTION
K. Leschonski 1974 15 p refs Transl. into ENGLISH from Chem.-Ing.-Tech. (West Germany), v. 46, no. 1, 1974 p 23-26
(CSIR-Trans-1178) Avail: NTIS HC $3.25

Particle size analysis and its use to measure mechanical processes of material conversion and property changes occuring during that conversion are studied. The linear measurements lie in the range from 0.01 to 0.1 microns and goes up to a few cm. Particle size analysis includes methods for measuring (1) size distribution which covers sedimentation, classification, and counting, (2) surface of the particulate state covering permeability, adsorption, and photometry, and (3) density. E.H.W.

N75-19386*# Scientific Translation Service, Santa Barbara, Calif.
THE DETERMINATION OF SMALL AMOUNTS OF FLUORINE
L. M. Dubnikov and I. F. Tikhomirov Washington NASA Feb. 1975 48 p refs Transl. into ENGLISH from Zavodsk. Lab. (Moscow), no. 7, 1947 p 773-796
(Contract NASw-2483)
(NASA-TT-F-16180) Avail: NTIS HC $3.75 CSCL 07D

Basic studies on determining small amounts of fluorine are reviewed and summarized briefly. These are studies that were presented and published before and through 1944. A comparative table of the different methods discussed is presented along with bibliographic information. Author

N75-19387*# Scientific Translation Service, Santa Barbara, Calif.
MASS SPECTROGRAPHIC STUDY OF THE EVAPORATION PRODUCTS OF ALKALINE EARTH CARBONATES
Georges Dejardin (Lyon Univ.), Guy Mesnard (Lyon Univ.), and Robert Uzan (Lyon Univ.) Washington NASA Mar. 1975 26 p refs Transl. into English from Le Vide (France), v. 16, no. 94, Jul. - Aug. 1961 p 157-166
(Contract NASw-2483)
(NASA-TT-F-16179) Avail: NTIS HC $3.75 CSCL 07D

The products that evolve at high temperature from alkaline earth carbonates utilized in the preparation of oxide cathodes were investigated. The experimental results show that it is possible to obtain information on the behavior of materials in the course of formation and activation of emissive coating. For numerous ions produced by electron bombardment, the evolution potentials were deduced from curves showing the variations in the ionic current as a function of the incident electron energies. By way of a comparison, a few gases were also studied under the same conditions. Author

N75-19388*# Kanner (Leo) Associates, Redwood City, Calif.
ELECTROCHEMICAL MEASUREMENTS IN MOLTEN NaOH
H. J. Krueger, A. Rahmel, and W. Schwenk Washington NASA Apr. 1975 27 p refs Transl. into ENGLISH from Electrochim. Acta (England), v. 13, 1968 p 625-643 (German language document)
(Contract NASw-2481)
(NASA-TT-F-16208) Avail: NTIS HC $3.75 CSCL 07D

Electrode materials such as platinum, gold, silver, nickel, and iron were investigated, but only iron was found to exhibit a positive potential shift relative to the other metals. It was found that the required for the corrosion reactions can be formed only by chemical reaction of the melt with carbon dioxide, but not by anodic oxidation, since peroxide oxidation essentially precedes the oxidation of hydroxide ions to oxygen and water vapor. In both anodic and cathodic polarization, peroxide reaction occurred and limiting currents appeared. Water vapor was reduced cathodically, generating limiting currents, before NaOH was reduced to H2 and OH(-). Anodically, platinum corrosion was stimulated by water vapor and produced current fluctuations. Author

N75-19389# Commissariat a l'Energie Atomique, Saclay (France).
ORIGINAL METHOD AND APPARATUS TO STUDY THE INTERACTION OF WATER VAPOR ON MATERIALS

(APPLICATION TO THE EVALUATION OF HYDROGEN PRODUCTS FIXED AND DESORBED FROM GRAPHITE AT DIFFERENT TEMPERATURES) Ph.D. Thesis - Paris Univ.
Jacques Chenion Oct. 1974 81 p refs In FRENCH
(CEA-R-4607) Avail: ERDA Depository Libraries HC $7.25

An apparatus designed for studies on the interaction of water vapor with a wide range of materials is described. The water vapor is carried by helium at atmospheric pressure. The extreme sensitivity of the method is due to the use of tritium, radioactive tracer of hydrogen. The apparatus used and both its scope and its limits are described. The results are greatly superior to those obtained with conventional methods (volumetry, thermogravimetry) and it offers great versatility of application, the specific activity of the tritiated water used as adsorbate being adaptable to the phenomenon investigated. The contribution of the apparatus itself in water vapor adsorption and desorption phenomena is examined. Finally the method and apparatus are applied to a short study of the action of water vapor on nuclear graphite. The quantities of hydrogen in the degassed products are evaluated and compared with the amount of water which has reacted with the graphite. Author (NSA)

N75-19390# Sandia Labs., Albuquerque, N.Mex.
MECHANICAL PROPERTIES OF OIL SHALE FROM ANVIL POINT UNDER CONDITIONS OF UNIAXIAL COMPRESSION
R. A. Schmidt and K. W. Schuler Aug. 1974 29 p refs
(Contract AT(29-1)-789)
(SAND-74-0035) Avail: NTIS HC $3.75

Unconfined compression tests on oil shale from Anvil Point, Colorado, indicate that the material properties measured are strongly dependent on kerogen content. Increased kerogen levels decrease the fracture strength, yield strength, and Young's modulus, and increase the dilatation, fracture strain, and energy to fracture. A model involving kerogen as a lubricant for crack surface sliding is proposed which accounts for most of the trends seen. The model is supported with direct observation of cracks in fractured specimens. Unloading data are also presented indicating that nonlinear elastic behavior predominates.
Author (NSA)

N75-19391# Los Alamos Scientific Lab., N.Mex.
STABILITY AND NONEXPLOSIVE HYDROGEN FLUORIDE PRODUCTION IN ATMOSPHERIC-PRESSURE HYDROGEN-OXYGEN-FLUORINE MIXTURES
R. W. Getzinger Jun. 1974 13 p refs
(Contract W-7405-eng-36)
(LA-5659) Avail: NTIS HC $3.25

The behavior of atmospheric pressure mixtures of H2, O2, and F2 at ambient temperatures was studied to determine conditions under which the reagents can be combined nonexplosively. An HF probe laser monitored the formation of HF during the mixing process and for the following 30 min, under conditions where < 5% of the reagents had disappeared. Hydrogen fluoride formed relatively promptly during mixing and at an essentially constant rate thereafter. Evidence is presented that heterogeneous reaction steps significantly influence the slow deterioration of prepared mixtures. Author (NSA)

N75-19392# California Univ., Livermore. Lawrence Livermore Lab.
HIGH TEMPERATURE CARBON EQUATION OF STATE
G. R. Gathers, J. W. Shaner, and D. A. Young 4 Sep. 1974 15 p refs
(Contract W-7405-eng-48)
(UCRL-51644) Avail: NTIS HC $3.25

The isobaric expansion technique is used to determine the equation of state of carbon at high temperatures and kilobar pressures. Glassy carbon samples are resistively heated to the melt and liquid regions, and the data are plotted in the enthalpy-volume and resistivity-enthalpy planes. The data are also approximately fitted with a GRAY three-phase equation-of-state model suitable for use in hydrodynamics codes.
Author (NSA)

N75-19393# Los Alamos Scientific Lab., N.Mex.
THERMOCHEMICAL PRODUCTION OF HYDROGEN FROM WATER Quarterly Report, 1 Jan. - 31 Mar. 1974
M. G. Bowman, comp. May 1974 13 p refs
(Contract W-7405-eng-36)
(LA-5606-PR) Avail: NTIS HC $3.25

Thermochemical cycles for production of hydrogen are investigated. The chemical reactions of three such cycles are demonstrated. Author (NSA)

N75-19394# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SPECIAL FEATURES OF CATALYSIS OF MAGNESIUM OXIDE AND OXIDE-DIELECTRICS WHICH ARE CLOSE TO IT
O. V. Krylov 4 Oct. 1974 22 p refs Transl. into ENGLISH from the book "Problemy Kinetiki i Kataliza. 15: Mekhanizm i Kinetika Geterogennykh Reaktsii" Moscow, 1973 p 85-94
(FTD Proj. T74-04-08)
(AD-A000186; FTD-MT-24-1754-74) Avail: NTIS CSCL 07/4

A study of acid-base heterogeneous catalysis made it possible to reveal a series of the general regularities inherent in homogeneous and heterogeneous reactions. The authors studied the catalytic properties of solid bases, in particular, those of the oxides of calcium, magnesium, barium, strontium, etc. These oxides accelerate the reactions of aldol condensation, polymerization of the oxides of olefins, isomerization of the oxides of olefins, isomerization of olefins, dehydrohalogenation, which are accelerated by bases also under homogeneous conditions. GRA

N75-19395# British Steel Corp., Sheffield (England). Information Services.
THE ANALYSIS OF SMALL QUANTITIES OF ENVIRONMENTAL DUST SAMPLES
N. M. Nicholson and J. Davey Oct. 1974 14 p
(PB-238171/3; GS/EX/44/74/C) Avail: NTIS HC $3.25 CSCL 07B

A method is described based on atomic absorption spectrometry for the determination of Fe, Mn, Cu, Zn, Pb, Ni, Cr, and Cd in samples of environmental fumes and dust obtained by a filtering procedure. The report describes the types of sample, collecting media examined, details the results of recovery and interference tests, and discusses minimum sample requirements in terms of limits of detection for each element determined. The method is now in general use in the Research Centre in connection with the work of the Environmental Services Section. GRA

N75-19396# Army Missile Command, Redstone Arsenal, Ala. Product Test and Failure Analysis Div.
X-RAY FLUORESCENCE ANALYSIS OF YTTRIUM-IRON-GADOLINIUM SOLUTIONS USED TO PREPARE SPRAY DRIED POWDER YTTRIUM-IRON-GADOLIUM
Emmett M. Magathan, David W. Short, and Roger L. Yocom Sep. 1974 47 p refs
(AD-A002065; QL-TR-74-3) Avail: NTIS CSCL 07/4

The purpose of this study was to develop an analytical quality control test method capable of monitoring the yttrium-iron-gadolinium ternary feed stock solutions used to produce phase shifter toroid powders for a planned radar system (SAM-D). An analytical quality control procedure using X-ray secondary emission spectrometry has been developed to monitor iron, yttrium, and gadolinium metal ion ratios in binary and ternary nitric acid feed stock solutions. These feed stock solutions are used to produce spray dried ferrimagnetic powders meeting specifications for ferrite and garnet elements used in microwave components. GRA

N75-19397# California Univ., Berkeley. Dept. of Chemistry.
THE CALCULATION OF ELECTRIC FIELD GRADIENTS FROM AB INITIO WAVE FUNCTIONS: 1,5-C2B3H5, 1,6-C2B4H6 AND 1,2-C2B4H6 Interim Technical Report, Sep. 1973 - Aug. 1974
John W. Jost and Chester T. OKonski 20 Oct. 1974 16 p refs
(Contract N00014-69-A-0200-1061; NR Proj. 053-546)
(AD-A002260; ITR-4) Avail: NTIS CSCL 07/4

Ab initio wave functions for 1,5-C2B3H5, 1,6-C2B4H6, and 1,2-C2B4H6 have been calculated using both STO-3G and 4-31 basis sets. The components of the electric field gradient tensor at the boron nuclei have been calculated from these wave

functions. The current calculations are also compared with previous calculations done with different basis sets than those used here. GRA

N75-19398# Naval Weapons Center, China Lake, Calif.
SHRIKE AND SPARROW MISSILE BASELINE COOKOFF TESTS Final Report, Jun. 1973 - Jan. 1974
Anthony Sanmiguel and Paul McQuaide Oct. 1974 225 p refs
(AD-A001676; NWC-TP-5672; NMC-TP-74-36) Avail: NTIS CSCL 16/4

The purpose was to determine the fast-cookoff characteristics of SHRIKE and SPARROW missiles when exposed to a JP-5 fuel fire. Time to cookoff reaction, type of reaction, and time/temperature data were obtained for each test. These data were analyzed and a hypothesis of the events leading to cookoff of the test items was formulated. These results are being used in the design of retrofit thermal protection systems for in-service missiles. These results are also applicable to the design of thermal protection systems for new missiles. GRA

N75-19399# Eagle-Picher Industries, Inc., Miami, Okla. Research Labs.
RESEARCH TO OPTIMIZE GROWTH TECHNIQUES FOR SINGLE CRYSTALS Final Report, 1 Jul. 1971 - 30 Jun. 1974
George N. Webb Nov. 1974 39 p
(Contract F33615-71-C-1532; AF Proj. 7367)
(AD-A002139; AFML-TR-74-221) Avail: NTIS CSCL 20/2

The synthesis from the elements of various high purity semiconductor materials of the Group II-VI compound type is discussed. A description of the pressure furnace system used for melting these compounds is given. The growth of crystals of pure II-VI compounds from the melt using this pressure furnace system is reported. In particular, melt crystal growth programs of ZnS, ZnSe, CdS, CdSe, and ZnTe are defined, including the results of special doping attempts on some of these crystals. It is concluded that the crystal growth processes described herein are practical for use with II-VI compound semiconductor materials. They are particularly recommended for the uniform doping of crystals. GRA

N75-19400# New York Univ., N.Y. Dept. of Chemistry.
VACUUM ULTRAVIOLET PHOTOELECTRON EMISSION SPECTROSCOPY OF LIQUID SYSTEMS: EXPERIMENTAL METHODS
L. Chia, L. Nemec, and P. Delahay Oct. 1974 49 p refs
(Contract N00014-67-A-0467-0019; NR Proj. 051-258)
(AD-A001806; TR-28) Avail: NTIS CSCL 14/2

Methodology for photoelectron emission spectroscopy by liquid systems is described for studies in the vacuum ultraviolet: preparation of chemicals, optical systems, cell design, electronics, calibration of photon flux, stray light. GRA

N75-19401# Johns Hopkins Univ., Baltimore, Md. Dept. of Chemistry.
THEORETICAL AND QUANTUM CHEMISTRY OF ENERGETIC SPECIES OF LIGHT METAL COMPOUNDS AND BORIDES Final Report, 15 Apr. 1969 - 30 Jun. 1974
Joyce J. Kaufman Aug. 1974 249 p refs
(Contract F44620-69-C-0110; AF Proj. 9750)
(AD-A001843; AFOSR-74-1904TR) Avail: NTIS CSCL 07/4

The applicability of the MS-X-alpha (multiple scattering) method to the refractory borides was investigated. Calibration calculations on the boron trihalides (fluoride through iodide) gave excellent agreement with experiment. The good agreement with experiment for pentaborane, B5H9, and for a carborane, 1,6,-B4C2H6, indicated the applicability of the method for boron polyhedra. Results for B6H6 (doubly negative) in a simulated crystal environment as a prototype of octahedral borides indicated that the negative charge probably would not be localized completely on the boron octahedron but would be shared with the metal atom. Ab-initio LCAO-MO-SCF calculations were carried out for a number of exotic light metal compounds. The results indicated whole new classes of light metal compounds including boron-lithium, carbon-lithium and aluminum-lithium families that should be capable of existence, synthesizable and have the potentiality of leading to new highly energetic species. For the prototype molecules BLi2 and CLi2 the results for a number of different excited states showed a wealth of interesting behavior. GRA

N75-19402# New York Univ., N.Y. Dept. of Chemistry.
VUV PHOTOELECTRON EMISSION SPECTROSCOPY OF LIQUID SYSTEMS
L. Chia, L. Nemec, and P. Delahay Oct. 1974 14 p refs
(Contract N00014-67-A-0467-0019; NR Proj. 051-258)
(AD-A001812; TR-27) Avail: NTIS CSCL 07/4

Feasibility and potential usefulness of studying photoelectron emission by pure liquids or solutions in the vacuum ultraviolet range are demonstrated by means of relatively simple equipment. Experimental results include: quantum yield spectral response curves for ferrocyanide, iodide and bromide ions; energy distribution curves for ferrocyanide. The photoionization spectrum of ferrocyanide in solution is determined and interpreted in terms of bound-continuum transitions and autoionization of excited bound states. GRA

N75-19403# California Univ., Los Angeles. Dept. of Chemistry.
COMBUSTION ANALYSIS AND THE CHEMISTRY OF FLAMES Final Report, 15 Oct. 1969 - 14 Oct. 1974
Kyle D. Bayes 1974 7 p
(Grant AF-AFOSR-1872-70; AF Proj. 9538)
(AD-A001915; AFOSR-74-1799TR) Avail: NTIS CSCL 21/2

Photoionization mass spectrometry was used to investigate the rates and mechanisms of several gas phase reactions. Several hydrocarbon free radicals were observed for the first time in low pressure flames. Two new radicals (C3H3, HC2O) were discovered and studied kinetically. The reaction of oxygen atoms and acetylene was studied extensively. The direct observation of free radicals lead to the development of a new technique to measure very fast rate constants, the approach to steady state methods. Two mechanisms and rate constants were shown to be important for the reaction of methyl radicals and oxygen molecules. GRA

N75-19404# Cornell Univ., New York. Sibley School of Mechanical and Aerospace Engineering.
DISECTION OF IGNITION DELAY TIMES VIA LASER-SCHLIEREN MEASUREMENTS OF DENSITY GRADIENTS AT SHOCK FRONTS
S. H. Bauer, W. J. McLean, and J. A. Miller 1974 34 p refs
(Grant AF-AFOSR-2744-74; AF Proj. 9781)
(AD-A001928; AFOSR-74-1751TR) Avail: NTIS CSCL 07/4

An experimental and analytical investigation of the initiation regimes in the pyrolysis and oxidation of methane behind shock waves has been carried out. The Laser-Schlieren technique was used to measure density gradient profiles behind incident shock waves in various CH4/Ar and CH4/O2/Ar mixtures in the temperature range 2000K to 2600K. Since the density gradient is proportional to the net rate of post-shock energy exchange, these experiments provide a highly resolved record of the net endo/exothermic balance throughout the initiation regime. In the analytical study, it was possible to ascertain which of the limited number of reactions and rates were consistent with the observed density profiles. While the induction times agreed with previous correlations, currently proposed oxidation mechanisms do not fully reproduce the observed shapes of the density gradients. GRA

N75-19405# EIC, Inc., Newton, Mass.
SULFUR-BASED LITHIUM-ORGANIC ELECTROLYTE SECONDARY BATTERIES Quarterly Report, 3 Mar. - 3 Jun. 1974
Gerhard L. Holleck, S. Barry Brummer, Michael J. Turchan, Clarence B. Ross, and Fred S. Shuker Dec. 1974 55 p refs
(Contract DAAB07-74-0072; DA Proj. 1T1-61102-A-34A)
(AD-A002701; C-405; QR-2; ECOM-74-0072-2) Avail: NTIS CSCL 07/4

The overall aim of this program is to develop a rechargeable lithium battery using an organic solvent. Studies were continued into the feasibility of soluble sulfur cathodes and transition metal sulfides. Exploratory investigations of the solubility, analysis and electrocatalysis of S in organic solvents, especially DMSO, are reported in Section II. Section III contains the first phase of a

more detailed study of the preparation, characterization and electrochemical performance of transition metal sulfides for use in secondary lithium batteries. GRA

N75-19406# Army Foreign Science and Technology Center, Charlottesville, Va.
TITANIUM COMPOUNDS CONTAINING HYDROGEN, NITROGEN AND OTHER NON-METALLIC ELEMENTS
G. P. Luchinskii 26 Sep. 1974 33 p refs Transl. into ENGLISH from the book "Khimiya Titan" Moscow, 1971 p 162-188
(AD-A002719; FSTC-HT-23-1381-73) Avail: NTIS CSCL 07/2

With hydrogen, nitrogen, its analogues, carbon, silicon, germanium, and boron, titanium forms compounds which are unique in that their composition is not principally determined by valence-stoichiometric correlations. The compounds to be considered here form limited solid solutions. Such a partially Berthollet character, and also some of the properties of these compounds, show that the internal chemical bond is similar to a metallic one. Titanium has the ability to form compounds of this type with hydrogen (hydrides), nitrogen (nitrides), phosphorus (phosphides), arsenic (arsenides), antimony (antimonides), bismuth (bismuthides), carbon (carbides), Silicon silicides, germanium (germanides), and boron (borides). Mixed compounds (for example the compounds of titanium with nitrogen and some other element) are similar in character to the ones listed above. Such mixed compounds are amides, imides, halonitrides, carbonitrides, etc. Phase diagrams and reactions are discussed. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N75-19407 British Library Lending Div., Boston Spa (England).
PROPERTIES OF EP590 ALLOY MELTED BY DIFFERENT METHODS
V. K. Tsvetova, L. N. Zimina, V. V. Topilin, V. P. Stepanov, and M. Ya. Dzugutov [1974] 12 p Transl. into ENGLISH from Stal (Moscow), no. 7, 1974 p 641-643 In ENGLISH and RUSSIAN
(BLL-M-25031-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

A study was made of the mechanical properties, chemical composition, nonmetallic inclusion rating and tramp element, and gas contents of EP590 high temperature alloy containing 17.4% Cr, 2.6% Ti, 1.1% Al, 8.6% Mo and 1.9% W melted in an air induction furnace and subsequently vacuum aro- and plasma-arc remelted. The sensitivity of specimens melted by these methods to stress concentrators was also analyzed. Both remelting zechniques gave almost equivalent properties. Author

N75-19408* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio
DUPLEX ALUMINIZED COATINGS Patent
Michael A. Gedwill and Salvatore J. Grisaffe, inventors (to NASA) Issued 11 Mar. 1975 4 p Filed 24 Jan. 1974 Supersedes N74-18197 (12 - 09, p 1063) Continuation-in-part of US Patent Appl. SN-298156, filed 16 Oct. 1972
(NASA-Case-LEW-11696-2; US-Patent-3,869,779; US-Patent-Appl-SN-436315; US-Patent-Class-29-194; US-Patent-Class-29-196.2; US-Patent-Class-29-196.6; US-Patent-Class-29-197; US-Patent-Appl-SN-298156) Avail: US Patent Office CSCL 11C

The surface of a metallic base system is initially coated with a metallic alloy layer that is ductile and oxidation resistant. An aluminide coating is then applied to the metallic alloy layer. The chemistry of the metallic alloy layer is such that the oxidation resistance of the subsequently aluminized outermost layer is not seriously degraded. Official Gazette of the U.S. Patent Office

N75-19409 Stanford Univ., Calif.
ADHESION OF EVAPORATED METAL FILMS TO FUSED SILICA Ph.D. Thesis
Linda Diane Yurk 1974 88 p
Avail: Univ. Microfilms Order No. 74-27142

Rapid expansion of the use of monolithic and thin film integrated circuits has spawned increased interest in metallization techniques. A number of factors affecting adhesion of metal thin films to glass substrates are reported and suggests controlling mechanisms for adhesion phenomena encountered under various conditions of deposition and aging. This work deals primarily with pure fused silca, since it is the most common material onto which the metal is deposited in integrated circuit fabrication. However, several tests were also run on material containing impurities of the nature of those acquired in the manufacture of doped silicon devices. Generally, the impurities decrease thin film adhesion through reduction of surface polarization or a decrease in the number of bonding sites available to the impinging metal atoms. Dissert. Abstr.

N75-19410 State Univ. of New York, Stony Brook.
A STUDY OF PHASE SEPARATION IN LIQUID QUENCHED ALUMINUM BASE ALLOYS Ph.D. Thesis
Satish Chandra Agarwal 1974 271 p
Avail: Univ. Microfilms Order No. 74-27807

Two aspects of the early-stage phase separation process in aluminum-base alloys are discussed: the spinodal decomposition in Al-Zn and Al-Ag systems, and the effect of liquid quenching on the concentrations of quenched-in vacancies known to play an important part in the transformation kinetics of aluminum-base alloys. The early-stage kinetics of both liquid-quenched and solid-quenched Al-Zn and Al-Ag alloys (which lie in the unstable region of the free energy-composition diagrams, and are most likely to decompose spinodally) was investigated using small-angle X-ray scattering and TEM techniques. Dilute Al-Zn and Al-Si alloys were examined for elucidating the role of quenched-in vacancies in liquid quenching through solid quenching. The experiments show that spinodal decomposition is operative in the initial stages of phase separation in aluminum-base zinc and silver alloys. The scattering data show agreement with Cahn's linear theory of spinodal decomposition and the TEM observations show characteristics commonly ascribed to the products of spinodal decomposition. Dissert. Abstr.

N75-19411+ Royal Aircraft Establishment, Farnborough (England).
THE EFFECT OF INTERSPERSED HEATING ON THE FATIGUE ENDURANCE OF ALUMINIUM ALLOY RIVETED LAP JOINTS IN CM001 MATERIAL
P. E. Kiddle and R. J. Kite May 1974 41 p refs
(RAE-TR-74052; BR42060) Avail: NTIS HC $3.75

Aluminum alloy riveted lap joints in CM001 material were tested under a sequence of fatigue loads. Some tests were interrupted at discrete intervals with periods of heat, with load (intermittent creep) or without load (intermittent heat). Intermittent heat caused fatigue life to be reduced to 50% nominal endurance at temperatures of 175 deg and 190 deg; at lower temperatures the effect was much less. Intermittent creep tended to oppose the effect of intermittent heat and at lower temperatures caused overall improvements in life. At heating periods of a few minutes, i.e. temperature cycling with no well time at maximum temperature and without load applied, mean life was consistently reduced to 60% nominal endurance over the range 140 to 190 deg. Mechanisms governing the fatigue-heat interactions are discussed. ESRO

N75-19412*# Rocketdyne, Canoga Park, Calif.
CRACK GROWTH IN ASME SA-105 GRADE 2 STEEL IN HYDROGEN AT AMBIENT TEMPERATURE
R. J. Walter 1975 54 p refs
(Contract NAS8-27980)
(NASA-CR-120702; RSS-8601) Avail: NTIS HC $4.25 CSCL 77F

Cyclic-load crack growth measurements were performed on ASME SA-105 Grade 2 steel specimens exposed to 10,000- and 15,000-psi hydrogen and to 5000-psi helium, all at ambient temperatures. The cyclic-load crack growth rate was found to be faster in high-pressure hydrogen than in helium. Cyclic-load crack growth rates in this steel were not reduced by preloading in air to a stress intensity of 1.5 times the cyclic K sub max in hydrogen. There are indications that holding under load in hydrogen, and loading and unloading in helium retards hydrogen-

accelerated cyclic-load crack growth. Cyclic frequency and R (ratio of K sub min /k sub max) were important variables determining crack growth rate. The crack growth rate increased as a logarithm of the cycle duration and decreased with increasing R. Author

N75-19413# National Aerospace Lab., Tokyo (Japan).
ON FATIGUE CRACK ARRESTING BY A STOP-HOLE IN 2024-T3 ALUMINUM ALLOY SHEET SPECIMENS
Hiroyuki Terada and Yoshiaki Kakuta 1974 18 p refs In JAPANESE; ENGLISH summary
(NAL-TR-359) Avail: NTIS HC $3.25

Attempts made to find out the most effective way to arrest the fatigue crack by the stop-hole are reported. The influence of the following three parameters on the crack propagation life was studied; the size of the stop-hole, the distance between the front edge of the stop-hole and the tip of the crack occured, and the crack length at the moment of repair. Single edge notched sheet specimens of 2024-T3 aluminum alloy were tested under partially tensile fatigue loads with constant stress amplitudes. Conclusions drawn from the study show: (1) repairing fatigue cracks of shorter length is more effective; and (2) the radius of the stop-hole must be large enough to release the stress near the crack tip sufficiently. The distance between the front edge of the stop-hole and the tip of the fatigue crack occurring must be short enough to leave sufficient residual width and to leave an effective residual compressive stress region around the crack tip. Author

N75-19414# National Aerospace Lab., Tokyo (Japan).
RELATION BETWEEN SCATTER OF FATIGUE LIFE AND S-N CURVE IN AIRCRAFT STRUCTURAL ALUMINIUM ALLOY 2024-T4
Toshiyuki Shimokawa and Yasumasa Hamaguchi Apr. 1974 10 p refs In JAPANESE; ENGLISH summary
(NAL-TR-360) Avail: NTIS HC $3.25

The accumulated effect on fatigue life of the experimental conditions, the material properties in its virgin state, and the cumulative process of damage in cyclic loading was investigated as an error in the applied stress. This concept was applied to the results of a series of fatigue tests on unnotched sheet specimens of aircraft structural aluminum alloy 2024-T4. Firstly, the S-N curve, where N is the median fatigue life, was determined from a series of experimental results. The equivalent stress of each specimen, which is considered to be the sum of the applied stress and its estimated error, was calculated from the S-N curve and the fatigue life of each specimen. The distribution of tye equivalent stress is quantitatively evaluated. Secondly, using the order statistics and assuming the distribution of the equivalent stress to be normal, the fatigue life distribution having the same scatter as that obtained in the experiment was introduced from the S-N curve and the assumed equivalent stress distribution. The interrelation between the scatter of the equivalent stress, the S-N curve, and the scatter of fatigue life is discussed. Author

N75-19415# Materials Research Labs., Maribyrnong (Australia).
MACRO-SEGREGATION IN STEEL PLATES
G. R. Wilms Oct. 1974 31 p refs
(Rept-612) Avail: NTIS HC $3.75

Macro-segregation, which occurred in a variety of commercial steel plates selected for fracture studies, was examined by metallography, chemical analysis and hardness tests. It was found that macro-segregation can be distributed in various ways through the plate sections which could be conveniently classified into five types, ranging from a broad band of either positive or negative segregation in the center of the plate to extensive indications of positive segregation in the outer regions of the plate. Some results are also given showing the effects of macrosegregation on mechanical properties. Author

N75-19416# Council for Scientific and Industrial Research, Pretoria (South Africa).
ELECTRICAL CONDUCTIVITY OF TIN CHALCOGENIDE MELTS
V. V. Malinovskij, A. A. Velikanov, and P. P. Sevcuk 1974 9 p refs Transl. into ENGLISH from Tr. Inst. Met. Akad. Nauk SSSR (USSR), no. 27, 1972 p 173-179
(CSIR-Trans-1180) Avail: NTIS HC $3.25

It was demonstrated that in the molten tin sulphide, polarisation phenomena characteristic of ionic melts were lacking, while the electrical conductivity polytherms had a positive temperature coefficient. A drop of electrical conductivity at the crystallization point is shown, and the width of the forbidden band for liquid SnS as 1.9 eV is also calculated. Author

N75-19417# California Univ., Livermore. Lawrence Livermore Lab.
STANDARDIZATION OF A SPECTROGRAPHIC METHOD FOR THE DETERMINATION OF CONSTITUENTS IN LOW-ALLOY STEELS
R. G. Garza 28 Aug. 1974 19 p refs
(Contract W-7405-eng-48)
(UCID-16627) Avail: NTIS HC $3.25

A general method for analyzing low-alloy steels in a concentration range of 0.05% to 1.00% was developed. The method was standardized for the determination of Mo, Mn, Ni, and Cr using iron as an internal standard. One of the principal advantages in using a solution method is that many problems of sample form and metallurgical history are eliminated. Author (NSA)

N75-19418# Michigan State Univ., East Lansing.
PROCEEDINGS OF THE 11TH RARE EARTH RESEARCH CONFERENCE: VOLUME 1, SESSIONS A THROUGH J
J. M. Haschke, ed. and H. A. Eick, ed. 1974 521 p refs Conf. held at Traverse City, Mich., 7-10 Oct. 1974
(Conf-741002-P1) Avail: NTIS HC $12.25

The conference was highly interdisciplinary and included sessions on bio-inorganic chemistry, coordination chemistry, magnetics, metal physics and metallurgy, organometallic chemistry, solid state science, and spectroscopy. Author

N75-19419# Aktiebolaget Atomenergi, Studsvik (Sweden).
ESTIMATION OF THE RATE SENSITIZATION IN NICKEL BASE ALLOYS
J. Wilberg 1974 15 p refs
(AE-495) Avail: ERDA Depository Libraries HC $4.00

An attempt was made to estimate the time for formation of a chromium depleted zone of width 200 A around grain boundaries in Inconel 600 and Incoloy 800. The calculations follow a theoretical model derived for sensitization of austenitic stainless steels with basic composition 18% Cr, 7% Ni at temperatures above 325 C. To apply this theory considerable extrapolations regarding Ni-content and temperature are necessary. Bearing in mind these extrapolations and some other assumptions, the calculations show that sensitization time at 325 C is of the order of 1,000 years for Incoloy 800 and 10 years for Incoloy 600. The uncertainty of these values is such, that the only possible statement about Incoloy 800 is that the risk of sensitization as defined above is small. Author (NSA)

N75-19420# California Univ., Berkeley. Lawrence Berkeley Lab.
CRYOGENIC TOUGHNESS THROUGH MICROSTRUCTURE CONTROL IN A FERRITIC Fe-Ni-Ti ALLOY
S. Jin, B. Whitaker, J. W. Morris, Jr., and V. F. Zackay May 1974 25 p refs Presented at the Properties of Mater. for Liquid Nat. Gas Tankage Symp., Boston, 21 May 1974
(Contract W-7405-eng-48)
(LBL-2756; Conf-740549-2) Avail: NTIS HC $3.25

The selection of composition and processing of a ferritic Fe-Ni-Ti alloy having a favorable combination of strength and toughness at cryogenic temperature is discussed. Criteria on alloy composition lead to the choice of low interstitial Fe-12Ni-0.25Ti. The alloy naturally has a favorable microstructure, but cryogenic toughness must be imparted through grain refinement. Several alternate procedures are identified. Four of these are discussed in detail, along with the resulting tensile properties at 77 K. Charpy impact energies at 77 K and 5 K, and behavior in fracture toughness tests at 77 K. Alloys are obtained having yield strengths to 150 KSI with impact toughness to 5 K. Author (NSA)

N75-19421# Northeastern Univ., Boston, Mass.
STRUCTURAL, THERMAL, AND ELECTRONIC PROPERTIES OF METASTABLE BINARY ALLOYS OF THORIUM AND URANIUM PRODUCED BY RAPID QUENCHING Final

Report
B. C. Giessen 1974 10 p refs
(Contract AT(11-1)-3395)
(COO-3395-11) Avail: NTIS HC $3.25

Splat cooling was used to prepare and study actinide and crystal chemically related rare-earth alloys, especially Th, Pu, Np, La, and Gd, with alloying elements such as Ti, Fe, Co, Ni, Cu, and Ga. X-ray diffraction and Moessbauer effect were used. New intermetallic phases such as ThFe, ThNi, and ThCu (CrB type) and Pu.60Ga.40 (CsCl type) were found. New nonsubstitutional solid solutions, probably of the disubstitutional type, were found in Th(Fe), Th(Cu), La(Fe), Gd(Fe), and Gd(Cu) alloys with solute concentrations up to 15%; these concentrated solid solutions represent a new class of alloys. Pu and Np alloys conzaining the bcc high temperature modification such as eta-Pu(Ti) and gamma-Np(Ga) were retained to RT for the first time; these alloys may be important because of the cubic actinide form retained. Pu-Ce alloys were studied and valence changes of Pu and Np in binary alloys were observed. Superconducting properties and thermal properties by differential scanning calorimetry were also measured. The structures of several other compounds of crystal chemical interest, such as TiCu3(m), (Al.5Nb.5)Ni3 and GexSby were also determined. Author (NSA)

N75-19422# California Univ., Berkeley. Lawrence Berkeley Lab.
CRACK PROPAGATION RATES IN Fe-Ni ALLOYS
H. A. Sirot Aug. 1974 112 p refs
(Contract W-7405-eng-48)
(LBL-2750) Avail: NTIS HC $5.25

Fatigue crack propagation rates of iron nickel cryogenic alloys with 4, 8, 12, and 16 wt % Ni were measured as a function of the stress intensity range Delta K at different temperatures. Room temperature tests showed that stage 2 crack propagation rates for cracks propagating faster than 0.2 micron/cycle are relatively insensitive to grain size, yield strength, or nickel content, and the rates were comparable to those found in a 5 Mo 0.3 C steel. An equiaxed alpha structure, obtained by a very slow cool, was found slightly less resistant to fatigue crack propagation than a structure containing martensite, which was obtained by an iced brine quench. This slight effect could be due to either the change in substructure or the residual stresses associated with the production of martensite. The 12 Ni 0.5 Ti alloy that was iced brine quenched showed the best crack propagation resistance. Crack growth rates at -77 C, -116 C, and -196 C were measured as the interspace between the striations seen on the fatigue fracture surface using a scanning electron microscope. NSA

N75-19423# Midwest Research Inst., Kansas City, Mo.
THE EFFECT OF STRAIN RATE ON THE CYCLIC RESPONSE OF METALS Final Report
J. R. Hancock and D. K. Benson Sep. 1974 19 p refs
(Contract F44620-72-C-0027; AF Proj. 9782; MRI Proj. 3591-E)
(AD-A000585; AFOSR-74-1722TR) Avail: NTIS CSCL 11/6

Unidirectional and cyclic strain hardening parameters were measured for several metals and alloys. Cyclic measurements were made under fully reversed strain control at constant strain rates between 0.003 and 0.3/sec. The cyclic strain hardening followed a power law relationship with no distinct dependence upon strain rate. Author (GRA)

N75-19424# Naval Research Lab., Washington, D.C.
A SELF-CONSISTENT THEORY OF STEADY-STATE LAMELLAR SOLIDIFICATION IN BINARY EUTECTIC SYSTEMS Interim Report
G. E. Nash and M. E. Glicksman Nov. 1974 85 p refs
(NRL Proj. 64M01-32)
(AD-A001704; NRL-MR-2940) Avail: NTIS CSCL 11/6

The potential theoretic methods recently developed at NRL for solving the diffusion equation are applied to the problem of lamellar eutectic solidification. This approach leads to a set of coupled nonlinear integro- differential equations for the shape of the solid-liquid interface and the solute concentration on the interface. The general characteristics of the solutions to these equations are discussed, and in particular it is shown that lamellar solutions may not be possible when the ratio of thermal gradient to freezing rate is less than some critical value which depends on the phase properties and the phase fraction. Selected numerical results are presented for the Pb-Sn eutectic system and compared to the results of Jackson and Hunt, who assumed a planar interface model. It is shown that the planar interface model can be a source of considerable error under certain conditions, and that the self-consistent model provides additional theoretical insights. GRA

N75-19425# Southwest Research Inst., San Antonio, Tex. Dept. of Materials Sciences.
BIAXIAL STRENGTH TESTS ON BERYLLIUM AND TITANIUM ALLOYS Final Report, Jul. 1971 - Apr. 1974
U. S. Lindholm, L. M. Yeakley, and D. L. Davidson Jul. 1974 56 p refs
(Contract F33615-71-C-1608; AF Proj. 7351)
(AD-A002137; AFML-TR-74-172) Avail: NTIS CSCL 11/6

Results of extensive biaxial testing of two new grades of beryllium and two titanium alloys, 6Al-4V and 6Al-6V-2Sn, are presented. The tests are conducted on thin-walled tubular specimens subject to combinations of axial load, torsion and internal pressure. The results include description of the yield, plastic flow and failure properties of these alloys under plane stress conditions. In each case, yield and plastic flow is adequately described by a Mises yield criterion and associated flow rule. Tensile failure is more accurately described by a maximum stress criterion, particularly for the beryllium which has low ductility. Biaxial ductility is shown to be very sensitive to both the form of the failure stress criterion and to the strain hardening modulus of the material. The effect of prestraining on subsequent ductility in beryllium is examined. GRA

N75-19426# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
J INTEGRAL ESTIMATES FOR STRAIN HARDENING MATERIALS USING FULLY PLASTIC SOLUTIONS Interim Report
C. F. Shih Aug. 1974 38 p refs
(Grant AF-AFOSR-2476-73; AF Proj. 6813; AF Proj. 9782)
(AD-A001939; DEAP-S-10; AFOSR-74-1871TR) Avail: NTIS CSCL 11/6

General procedures are proposed which use the elastic and the fully plastic solutions to interpolate behavior from the small scale yielding range to the fully plastic range. The relations between the J-integral, load point displacement, crack opening displacement and the applied load thus developed, are applicable to test configurations and cracked bodies in general. To assess the accuracy of the estimated relationships, a detailed numerical investigation, which employs an accurate finite element approach, is carried out for a particular configuration under anti-plane shear. The results obtained from the full numerical calculations, for values of the applied load well into the fully plastic range, are in excellent agreement with the estimated results. GRA

N75-19427# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
DEVELOPMENT OF A VERY HIGH STRENGTH DISK ALLOY FOR L400F SERVICE Final Report, 30 Jun. 1972 - 30 Jun. 1974
J. L. Bartos Nov. 1974 164 p refs
(Contract F33615-72-C-1797; AF Proj. 7351)
(AD-A001937; AFML-TR-74-187) Avail: NTIS CSCL 11/6

The primary objective of the program was to develop an advanced powder metallurgy disk alloy for 1400F service which combined high tensile and creep rupture properties with exceptional low cycle fatigue strength. A three phase experimental program was designed to accomplish this goal. Preliminary studies were conducted prior to initiation of Phase I to identify seven alloy/process combinations to be evaluated in Phase I. Mechanical property screening tests were conducted on subscale disks during Phase I in order to define one alloy/process combination for scale-up in Phase II. On the basis of Phase I results, an alloy designated AF-115 was identified which easily exceeded program low cycle fatigue goals and nearly met all program tensile and creep rupture goals. Analysis of AF-115 during Phase II verified that the excellent mechanical properties produced during Phase I could also be achieved in larger disk forgings. Phase III of the program consisted of a cursory alloy

development effort directed at exploring the potential of relatively low density superalloys. GRA

N75-19428# Dayton Univ., Ohio.
RCo5 COERCIVITY Technical Report, 1 Jul. 1972 - 4 Jun. 1974
C. W. Searle and H. J. Garrett Aug. 1974 71 p refs
(Contract F33615-73-C-5020)
(AD-A002135; AFML-TR-74-156) Avail: NTIS CSCL 11/6

Hysteresis loops associated with single crystals of Nd(1-x)Sm (x)Co(5) were experimentally investigated. The results of this investigation lead to a theoretical Model which could describe the experimental data. The Model was further refined and checked which put it on firm experimental grounds. The state-of-the-art production process for SMCo5 sintered permanent magnets was analysed in terms of the Model. An alteration of the production process is presented which could result in better permanent magnets. GRA

N75-19429# Army Foreign Science and Technology Center, Charlottesville, Va.
THERMOELECTRIC PROPERTIES OF GALLIUM-NICKEL SYSTEM ALLOYS UNDER STANDARD CONDITIONS
E. K. Iordanishvili, N. F. Kartenko, A. G. Orlov, and A. D. Finogenov 14 Jun. 1974 13 p refs Transl. into ENGLISH from Geliotekhnika (USSR), no. 4, 1972 p 36-42
(AD-A001735; FSTC-HT-23-0015-74) Avail: NTIS CSCL 11/6

A number of alloys of the Ga--Ni system were synthesized from the elements within the concentration range of 25 to 65 atomic %. Their phase composition was determined at a temperature close to standard. The specific electrical conductivity, the Seebeck coefficient and the thermal conductivity coefficient were measured. The Lorenz number for one-- and two--phase poly-crystal ingots was also calculated. GRA

N75-19430# Massachusetts Inst. of Tech., Cambridge. Dept. of Metallurgy and Materials Science.
MACHINE CASTING OF FERROUS ALLOYS Interim Technical Report, 1 Jan. - 30 Jun. 1974
M. C. Flemings, R. Mehrabian, J. R. Melcher, R. G. Riek, and N. Matsumoto Sep. 1974 69 p ref
(Contract DAAG46-73-C-0110; ARPA Order 2267)
(AD-A001727; AMMRC-CTR-74-55) Avail: NTIS CSCL 11/6

Emphasis of the work is on development of a process or processes involving casting of semi-solid alloys. During the six month period of research covered by the report, emphasis was on developing casting systems which combine (1) a method of producing a semi-solid slurry continuously, (2) a gel or collection chamber, and (3) a casting machine. A large number of castings were produced of a low melting point alloy, and of a copper base alloy. A limited number were also produced of a ferrous alloy (fe-2.5%C-3.1%Si). Other work reported is on development of a process for electromagnetically injecting semi-solid or liquid alloys into metal mold and on thermal analysis of mold behavior in casting of semi-solid ferrous alloys. GRA

N75-19431# Connecticut Univ., Storrs. Inst. of Materials Science.
METALLURGICAL ASPECTS OF FRACTURE TOUGHNESS Interim Report
A. J. McEvily Aug. 1974 28 p refs
(Grant AF-AFOSR-2703-74; AF Proj. 9782)
(AD-A001758; UC-MET-3-1974; AFOSR-74-1698TR) Avail: NTIS CSCL 11/6

In this paper a review of current topics of interest with respect to the interrelationship between microstructure and toughness is given. In the analytic treatments important parameters are particle size and spacing, the modulus, strength level and a measure of dutility. Metallurgical variables include mode of failure (cleavage, intergranular, transgranular), grain size, twins, temper embrittlement, slip mode, and sulfide morphology. Examples of the influence of these various factors on fracture toughness are given. GRA

N75-19432# Florida Univ., Gainesville. Engineering and Industrial Experiment Station.
THE ROLE OF INTERSTITIALS IN THE ANOMALOUS WORK HARDENING OF METALS AND ALLOYS Final Report
Robert E. Reed-Hill and Walter R. Cribb 11 Nov. 1974 40 p refs
(Grant DA-ARO(D)-31-124-72-G70)
(AD-A001722; ARO-9826.14-MC) Avail: NTIS CSCL 11/6

An investigation of the strength of dynamic strain aging in nickel and nickel-cobalt alloys of different stacking fault energies using approximately 25 micrometer grain size tensile specimens deformed at a crosshead speed of 0.02 in/min between approximately 77 and 900K has shown that the phenomenon is exhibited prominantly only in Nickel 200. The ultimate strength peak that occurs in Nickel 200 at approximately 525K has been shown not to be a true work hardening peak in the sense of that in Fe and Ti. Change in strain rate tests were performed on Nickel-40% Cobalt and Nickel-60% Cobalt alloys and confirmed other indications that only mild dynamic strain aging occurs in these alloys. It was found that Nickel-60% Cobalt alloy twins heavily at low temperatures and probably accounts for an approximately tenfold increase in strength and a total elongation of approximately 100% in this alloy. GRA

N75-19433# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EFFECT OF SOLID INCLUSIONS ON CHANGE IN STRUCTURE AND PROPERTIES OF TWO-PHASE ALLOYS UNDER SHOCK LOADING
M. P. Bondar, A. M. Staver, and E. Sh. Chagelishvili 15 Nov. 1974 13 p refs Transl. into ENGLISH from the book "Gorenie i Vzryv" Moscow, Izd vo Nauka, 1972 p 549-553
(AD-A001867; FTD-HT-23-1987-74) Avail: NTIS CSCL 11/6

The goal of the present work is to study the effect of shock waves on the change in structure and properties of two-phase materials and to investigate the influence of size, shape, and the distribution of the solid phase on the structure of the material after shock loading. The subjects of this study were alloys Cu-Al2O3 containing a small concentration of the solid phase and alloys WC-Co and W2C-WC-W containing a high concentration of the solid phase. GRA

N75-19434# Naval Ship Research and Development Center, Annapolis, Md.
CORROSION OF ALUMINUM ALLOYS IN EXFOLIATION-RESISTANT TEMPERS EXPOSED TO MARINE ENVIRONMENTS FOR TWO YEARS Research and Development Report
Ernest J. Czyryca and Harvey P. Hack Nov. 1974 23 p refs (SF54541)
(AD-A002234; NSRDC-4432) Avail: NTIS CSCL 11/6

The corrosion behavior of 5086, 5083, and 5456 aluminum alloys in H116 and H117 tempers was evaluated after 2 years of exposure to three marine environments; namely, fully submerged in sea water, splash and spray zone, and marine atmosphere. The alloys displayed good corrosion resistance with no exfoliation or pitting observed. Panels of the same alloys in a sensitized condition exposed to the same environments showed some pitting and edge attack but did not indicate a long-term corrosion problem. GRA

N75-19435# Carnegie-Mellon Univ., Pittsburgh, Pa. Metals Research Lab.
ALLOY DESIGN TO RESIST HYDROGEN EMBRITTLEMENT
I. M. Berstein and A. W. Thompson (Rockwell Intern. Corp., Thousand Oaks, Calif.) 21 Nov. 1974 87 p refs Submitted for publication
(Contract N00014-67-A-0314-0019; NR Proj. 036099)
(AD-A002274; TR-3; CMU-036-099-3) Avail: NTIS CSCL 11/6

The behavior of steel, titanium, aluminum and nickel alloys are analyzed in terms of the specific interrelationships between metallurgical variables and the susceptibility towards hydrogen embrittlement. It is demonstrated that specific recommendations can be made which should improve the performance of a given material in a hydrogen-bearing or producing environment. These recommendations are balanced with nonenvironmental strength and toughness constraints, since little progress would be made, for example, by changing an alloy from hydrogen-embrittlement-critical to toughness-critical in a given design environment. GRA

N75-19436# Frankford Arsenal, Philadelphia, Pa.
DEVELOPMENT OF INTENSIOSTATIC-GALVANIC STRESS CORROSION TEST FOR HIGH STRENGTH ALUMINUM ALLOYS
Joseph J. Gordon and James V. Rinnovatore Mar. 1974 15 p refs
(AD-A002599; FA-M74-6-1) Avail: NTIS CSCL 11/6

An investigation was performed to identify improved methods for determining the stress corrosion resistance of strain hardenable 5083 alloy and heat-treatable high strength 7075 and 7050 alloys. An intensiostatic test method was investigated for strain hardenable 5083 alloy and the results showed that the test is capable of discriminating among conditions which have small differences in susceptibility to stress corrosion. The improvement in the sensitivity of the intensiostatic test as compared to the conventional alternate immersion test is shown to be significant. In addition, the test is more rapid than the conventional alternate immersion test. A galvanic test method was investigated for two copper bearing high strength aluminum alloys, 7075 and 7050. The results showed that the galvanic test is capable of discriminating among various tempers of the alloys which possess a wide range of stress corrosion susceptibility. The test is also more rapid than the conventional alternate immersion test. GRA

N75-19289 Louvain Univ. (Belgium). Dept. of Metallurgy.
SILVER SAMPLES MELTED IN SKYLAB EXPERIMENT M565
A. Deruyttere, E. Aernoudt, H. Goeminne, J. Smeesters, O. Arkens, and M. Verhaeghen *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 27-44 refs (For availability see N75-19285 11-12)

N75-19298 Hamburg Univ. (West Germany).
METALLURGICAL APPLICATIONS OF A SPACE ENVIRONMENT
H. Ahlborn *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 155-162 (For availability see N75-19285 11-12)

N75-19306 Louvain Univ. (Belgium). Lab. of Physical Metallurgy.
PREPARATION OF ALLOYS UNDER SPACE CONDITIONS
A. Berghezan *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 219-228 refs (For availability see N75-19285 11-12)

N75-19307 Fulmer Research Inst., Ltd., Stoke Poges (England).
MULTIPHASE SOLIDIFICATION
C. D. Desforges *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 229-234 refs (For availability see N75-19285 11-12)

N75-20210 European Space Research Organization, Paris (France).
MEASUREMENT OF FATIGUE CRACK PROPAGATION AT HIGH TEMPERATURES IN AU2GN ALUMINIUM ALLOY
Georges Vidal, Pierre Yves LeRoy et al *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1974-2 Dec. 1974 p 35-59 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1974-2, Mar.-Apr. 1974 p 83-93 (For availability see N75-20207 11-99)

N75-20215 European Space Research Organization, Paris (France).
FATIGUE CRACK PROPAGATION OF AN AU2GN ALUMINIUM ALLOY AS A FUNCTION OF THE RUPTURE MODE
Georges Vidal, Pierre Yves LeRoy, Dominique Miannay et al *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1974-2 (ESRO-TT-113) Dec. 1974 p 111-117 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1974-2, Mar.-Apr. 1974 p 115-117 (For availability see N75-20207 11-99)

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N75-19437 Ecole d'Application des Hauts Polymeres, Strasbourg (France).
STUDY OF ADHESION ON GLASS PLATE OF POLYMERS ESPECIALLY SYNTHESIZED FOR OBTAINING MAXIMUM ADHESIVITY: SYNTHESIS AND CHARACTERISTICS OF ADHESIVE SEQUENCED COPOLYMERS Final Report [ETUDE DE L'ADHESION SUR LE VERRE EN PLAQUE DE POLYMERES SPECIALEMENT SYNTHETISES POUR OBTENIR L'ADHESIVITE MAXIMUM. SYNTHESE ET CARACTERISATION DE COPOLYMERES SEQUENCES ADHESIFS]
Guy Meyer Feb. 1974 16 p In FRENCH; ENGLISH summary Presented at the DGRST Colloq. on Materiaux Macromoleculaires, Paris, 2-3 May 1973
(Contract DGRST-71-7-2989)
Avail: Issuing Activity

A number of (styrene-b-isoprene) copolmers were prepared, and some of them were modified by reacting with maleic anhydride. Variation of their adhesive properties was investigated as a function of their molecular weight and elastomer rate. In simple lap joints (glass to glass), the best results were obtained with copolymers about 40,000 in molecular weight and 30% polyisoprene content. Some modified copolymers had their adhesive properties notably increased. ESRO

N75-19438 Centre de Recherches sur les Macromolecules, Strasbourg (France).
SYNTHESIS OF STATISTICAL TYPE HIGHLY MONODISPERSE COPOLYMERS AND THEIR USE AS LUBRICANT ADDITIVES Final Report [SYNTHESE DE COPOLYMERES DE TYPE STATISTIQUE HAUTEMENT MONODISPERSES ET LEUR UTILISATION DANS LE DOMAINE DES LUBRIFIANTS]
Yves Gallot Mar. 1974 6 p In FRENCH
(Contract DGRST-72-7-0735)

A series of statistic copolymers was obtained via anionic polymerization from mixtures of several alkyl metacrylates. These copolymers were shown to be highly monodispersive in molecular mass and composition. Their use as lubricant oil additives improves the oil's thickness, resistance to shear stress and heat stability. These last two properties have higher values than those correspondingly obtained with polymeric additives.
ESRO

N75-19439 Compagnie de Saint Gobain (France). Service Central de Recherche.
STUDY OF ADHESION ON GLASS PLATES OF POLYMERS ESPECIALLY SYNTHESIZED FOR MAXIMUM ADHESIVITY Final Report [ETUDE DE L'ADHESION SUR VERRE EN PLAQUES DE POLYMERES SPECIALEMENT SYNTHETISES EN VUE DE L'ADHESION MAXIMUM]
M. Martin Jan. 1974 29 p In FRENCH; ENGLISH summary Presented at the DGRST Colloq. on Materiaux Macromoleculaires, 2-3 May 1973
(Contract DGRST-72-7-0001)
(Rept-3106/73) Avail: Issuing Activity

Performances of commercial adhesives and sequenced polymers chemically treated for glass-glass, glass-metal, and glass-wood bonded assemblies, were compared by applying a mechanical test devised for measuring the resistance of joints to shear strain by compression. It was found that exposure of joints to artificial ageing procedures, i.e. temperature variations, humidity, and UV radiation, reduces mechanical strength. A standard surface was prepared by cleaning glass surfaces with cerium oxide in alcohol. Treatment of glass by appropriate silane solutions improved performances. ESRO

N75-19440*# Rockwell International Corp., Downey, Calif. Space Div.
PROTOTYPE RIGID POLYIMIDE COMPONENTS Final Report

D. H. Wykes 11 Mar. 1975 90 p
(Contract NAS9-12302)
(NASA-CR-141702) Avail: NTIS HC $4.75 CSCL 11D

The activity is reported which was conducted for utilizing spin-off Apollo base technology to fabricate a variety of commercial and aerospace related parts that are nonflammable and resistant to high-temperature degradation. Manufacturing techniques and the tooling used to fabricate each of the polyimide/glass structures is discussed. A brief history, tracing the development of high-temperature polyimide resins, is presented along with a discussion of the properties of DuPont's PI 2501/glass material (later redesignated PI 4701/glass). Mechanical and flammability properties of DuPont's PI 2501/glass laminates are compared with epoxy, phenolic, and silicone high-temperature resin/glass material systems. Offgassing characteristics are also presented. A discussion is included of the current developments in polyimide materials technology and the potential civilian and government applications of polyimide materials to reduce fire hazards and increase the survivability of men and equipment. Author

N75-19441# Canada Inst. for Scientific and Technical Information, Ottawa (Ontario).
A STUDY OF THE EQUILIBRIUM IN THE SYSTEM FeS-S2. 1: DISSOCIATION EQUILIBRIUM OF PYRITE AT LOW TEMPERATURE
S. Kano 1975 30 p refs Transl. into ENGLISH from Ganseki Kobutsu Kosho Gakkai-shi (Japan), v. 57, no. 3, 1967 p 81-97
(NRC/CNR-TT-1788) Avail: NTIS HC $3.75

The equilibrium of the system Fe (1-x)s-FeS2-S2 with the natural pyrite was investigated in the temperature range 240-180 C, using the transportation method by the hydrogen gas stream. The experimental results show that the phase coexisting at equilibrium with pyrite is hexagonal pyrrhotite, whose d(102) value is 2.070 + or - 0.001 A, corresponding to the composition 47.7 atomic per cent Fe, and is not dependent upon the temperature. The temperature dependence of the dissociation pressure was obtained. From the additional heating experiment carried out in the air-atmosphere, it is suggested that monoclinic pyrrhotite may be produced under the existence of oxygen at temperatures below 325 C. Author

N75-19442# Canada Inst. for Scientific and Technical Information, Ottawa (Ontario).
Fe-S PHASE DIAGRAM
Yu. N. Vdodov and A. A. Kashaev 1975 11 p refs Transl. into ENGLISH from Tr. Soveshch. Eksp. Tekh. Mineral. Petrogr. 8th (Moscow), 1971 p 312-316
(NRC-CNR-TT-1789) Avail: NTIS HC $3.25

Phase equilibrium in sulfide systems was studied by recrystallizing the charge in an aqueous solution of chemically pure NH4Cl. The pressure was 1,000 atm and was given by the degree of filling in the P-V-T diagram. The experiments lasted from 5 to 60 days, depending on the temperature. It was assumed that equilibrium was established when the composition of pyrrhotite, which crystallized out together with pyrite at a given temperature, no longer depended on the composition of the charge (Fe + S or FeS + S), and there was good agreement between the pyrrhotite-pyrite solvus curves obtained by dry and hydrothermal methods. The effect of pressure on the position of the solvus is insignificant, and can be ignored; the effect of pressure on the formation and stability of superstructures is less significant. Author

N75-19443*# Massachusetts Inst. of Tech., Cambridge. Dept. of Electrical Engineering and Computer Sciences.
FABRICATION AND EVALUATION OF POLYMERIC EARLY-WARNING FIRE-ALARM DEVICES
Stephen D. Senturia [1975] 106 p refs
(Contract NAS3-17534)
(NASA-CR-134764) Avail: NTIS HC $5.25 CSCL 11D

The electrical resistivities were investigated of some polymers known to be enhanced by the presence of certain gases. This was done to make a device capable of providing early warning to fire through its response with the gases produced in the early phases of combustion. Eight polymers were investigated: poly(phenyl acetylene), poly(p-aminophenyl acetylene), poly(p-nitrophenyl acetylene), poly(p-formamidophenyl acetylene), poly(ethynyl ferrocene), poly(ethynyl carborane), poly(ethynyl pyridine), and the polymer made from 1,2,3,6 tetramethyl pyridazine. A total of 40 usable thin-film sandwich devices and a total of 70 usable interdigitated-electrode lock-and-key devices were fabricated. The sandwich devices were used for measurements of contact linearity, polymer conductivity, and polymer dielectric constant. The lock-and-key devices were used to determine the response of the polymers to a spectrum of gases that included ammonia, carbon monoxide, carbon dioxide, sulfur dioxide, ethylene, acrolein, water vapor, and normal laboratory air. Strongest responses were to water vapor, ammonia, and acrolein, and depending on the polymer, weaker responses to carbon dioxide, sulfur dioxide, and carbon monoxide were observed. A quantitative theory of device operation, capable of accounting for observed device leakage current and sensitivity, was developed. A prototype detection/alarm system was designed and built for use in demonstrating sensor performance. Author

N75-19444# Royal Aircraft Establishment, Farnborough (England).
THE CALCULATION OF GLASS TEMPERATURES OF FLUORINE-CONTAINING POLYMERS
A. A. Yarosh, A. A. Askadskii, S. P. Krukovskii, V. G. Dashevskii, G. L. Slonimskii, and V. A. Ponomarenko Dec. 1974 15 p refs Transl. into ENGLISH from Vysokomolekul. Soedin. (USSR), v. (A)16, no. 3, 1974 p 527-533
(RAE-Lib-Trans-1812; BR46701) Avail: NTIS HC $3.25

A method of calculation was developed for determining the glass temperature of fluorine-containing polymers. It is shown that there is excellent agreement between the calculated and experimental values of T sub g. The specific influence of the fluorine atoms and fluorine-containing groups on the glass temperature was determined. Author

N75-19445# Bendix Corp., Kansas City, Mo.
RIGID URETHANE FOAM BASED ON METHYL-ALPHA-(D)-GLUCOSIDE AND E-CAPROLACTONE
J. W. McFarland Nov. 1974 36 p refs Revised
(Contract AT(29-1)-613)
(BDX-613-1140-Rev) Avail: NTIS HC $3.75

A study was made of resins based on methyl-alpha-(D)-glucoside. Foams prepared using this resin and a prepolymer based on polymethylene polyphenyl isocyanate had excellent high temperature strength when tested at 400 F (204.4 C). Best results were obtained with methyl glucoside purchased as a 65-percent water solution containing 30 percent beta-methyl-glucoside. Author (NSA)

N75-19446# Bendix Corp., Kansas City, Mo.
MOLDING MINIATURE PLASTIC PARTS
D. P. Pope Nov. 1974 26 p
(Contract AT(29-1)-613)
(BDX-613-1212-Rev) Avail: NTIS HC $3.75

Small mechanical parts, normally made by expensive machining, were produced using coffin molds in combination with injection and transfer molding processes and materials. Functional parts can now be molded satisfactorily: transfer molding produced fine pitch gears to AGMA Class 9 standards. A tumbling process for flash removal was also developed. Author (NSA)

N75-19447# Lehigh Univ., Bethlehem, Pa. Dept. of Metallurgy and Materials Science.
DEFORMATION MECHANISM MAPS: A REVIEW WITH APPLICATIONS
M. R. Notis 1974 23 p refs Presented at Symp. on Plastic Deformation of Ceramics, University Park, Pa., 17-19 Jul. 1974 Submitted for publication
(Contract AT(11-1)-2408)
(Conf-740724-3) Avail: NTIS HC $3.25

Deformation mechanism mapping has recently evolved as a method for quantitatively expressing complex deformation equations while at the same time allowing visual insight into understanding of these deformation processes. Techniques for the generation of deformation mechanism maps are described, specific applications in the literature to date are reviewed, and some applications not previously considered are presented. These include the examination of sequential dependent deformation processes, grain boundary sliding, and the use of deformation

mechanism maps to interpret pressure-sintering kinetics.
Author (NSA)

N75-19448# Massachusetts Univ., Amherst. Materials Research Lab.
CONCERNING THE NEGATIVE THERMAL EXPANSION FOR EXTENDED CHAIN POLYETHYLENE Interim Report
Roger S. Porter, Norman E. Weeks, Numa J. Capiati, and Rudolf J. Krzewki 1 Nov. 1974 18 p refs
(Contract N00014-67-A-0230-0011; NR Proj. 356-584)
(AD-A001388) Avail: NTIS CSCL 07/3

Thermal expansion coefficients have been measured on ultraoriented polyethylene fibers. Samples were prepared by a solid-state (crystalline extrusion in an Instron Capillary Rheometer at 136C, 2100 atm. and at a draw ratio of 50. The expansion coefficients between -150 and +50C, perpendicular to the fiber axis, were positive and of the order of .0001/deg C. Conversely, parallel to that direction, the observed values were both negative and small. Length changes were reversible and reproducible between -150 and +50C. Negative coefficients were attributed to the presence of highly-extended and fully aligned chains along the fiber. GRA

N75-19449# Westinghouse Electric Corp., Pittsburgh, Pa. Research and Development Center.
EFFECT OF SELECTED IMPURITIES ON THE HIGH TEMPERATURE MECHANICAL PROPERTIES OF HOT-PRESSED SILICON NITRIDE
J. L. Iskoe, F. F. Lange, and E. S. Diaz 18 Oct. 1974 19 p refs
(Contract N00014-74-C-0284; ARPA Order 2697)
(AD-A002251; Rept-74-9DR-POWDR-R2) Avail: NTIS CSCL 11/2

The strength of commercial hot-pressed silicon nitride has been shown to degrade severely at elevated temperatures. As the temperature is increased the amount of non-elastic deformation occurring prior to fracture has been found to increase significantly. This reduction in high temperature strength and creep resistance is believed to be associated with impurities. Selected impurities were therefore added as oxides or carbonates (Al_2O_3, CaO, Fe_2O_3, Li_2CO_3 and Na_2CO_3) to both a relatively pure alpha-phase silicon nitride powder and a relatively pure beta-phase silicon nitride starting powder. These powders were then hot-pressed to full density using 5 wt % MgO as the pressing additive. The silicon nitride hot-pressed from the alpha-phase powder exhibits higher strength at both 25C and 1400C than that fabricated from the beta-phase powder. The impurity additions had no effect on the room temperature mechanical properties. GRA

N75-19450# Naval Ship Research and Development Center, Annapolis, Md.
BEHAVIOR OF STABILIZED ZIRCONIA IN MOLTEN SODIUM SULFATE Research and Development Report
R. L. Clarke and S. J. Dapkunas Nov. 1974 20 p refs
(AD-A001695; NSRDC-4406) Avail: NTIS CSCL 11/2

Samples of zirconia (ZrO_2) stabilized with various oxides including calcia (CaO), magnesia (MgO), and yttria (Y_2O_3) were exposed to molten sodium sulfate (Na_2SO_4) at 1650F for periods up to 1000 hours to obtain an indication of the materials: resistance to sulfidation. Analysis by light and scanning electron microscopy, together with elemental X-ray fluorescence spectroscopy, indicated only slight attack of the zirconia manifested by surface roughening and the formation of crystalline growths thought to have a composition similar to that of zircon ($ZrSiO_4$). Thin, glass-like layers were formed on the surfaces of the MgO- and Y_2O_3-stabilized specimens tested for 1000 hours. Both the glassy layers and the crystalline growths contained trace amounts of sodium (Na), indicating that some reaction with the Na_2SO_4 had occurred. GRA

N75-19451# University of Southern Calif., Los Angeles. Electronic Science Lab.
ALUMINUM NITRIDE FOR SURFACE ACOUSTIC WAVES Fifal Report, 2 Jan. - 30 Jun. 1974
Kenneth M. Lakin Aug. 1974 37 p refs
(Kontract F33615-74-C-5040; AF Proj. 7371)
(AD-A002138; AFML-TR-74-186) Avail: NTIS CSCL 20/2

Aluminum nitride films of single crystal quality have been grown upon single crystal R-plane sapphire substrates. It was demonstrated that AIN could also be grown upon another AIN film that had been polished. In this manner thick films of 10 micrometers thickness or greater could be obtained. Scanning electron microscopy was used to evaluate the as-grown film morphology and show the micro-structure orientation coherence. The surface acoustic wave properties of the film were measured out to a film thickness to wavelength ratio of 0.75. GRA

N75-19452# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Macromolecular Science.
THE MECHANISM OF CRAZING IN POLYSTYRENE
Stephen Wellinghoff and Eric Baer 25 Oct. 1974 57 p refs
(Contract N00014-67-A-0404-0012)
(AD-A001764; TR-269) Avail: NTIS CSCL 11/9

The craze initiation and growth process in thin films of polystyrene has been studied via electron microscopy. Inhomogeneity in the surface microstructure gave rise to the formation of c.a. 300A nuclei in which large strains were localized. These randomly distributed nuclei were formed at the glass transition temperature in the presence of bulk shear deformation. A disk shaped microneck zone was ultimately formed by coalescence of these nuclei which was followed by cavitation and fibrillation of this zone at a critical internal hydrostatic tension. Cavity and fibril stability increased with molecular weight above the entanglement molecular weight. GRA

N75-19453# Naval Aerospace Recovery Facility, El Centro, Calif.
THE DEGRADATION OF NYLON BY IRON RUST Final Report
Richard I. Tubis Aug. 1974 22 p refs
(AD-A001720; NAVAERORECOVFAC-TR-8-74) Avail: NTIS CSCL 11/5

Nylon (both fabric and cord) was exposed to iron rust, Fe_2O_3, and $FeCl_3$, in environments of sea water (synthetic), distilled water, pH4 and pH10. The iron rust and Fe_2O_3 were found to be not significantly chemically degrading to the nylon. The $FeCl_3$ was degrading as expected. GRA

N75-19454# Brush Wellman, Inc., Elmore, Ohio.
PRODUCTION ENGINEERING MEASURES TO MANUFACTURE SUPER FINE FINISH BERYLLIA Quarterly Progress Report, 30 Jun. - 30 Sep. 1974
Glenn H. Rees 29 Oct. 1974 32 p refs
(Contract DAAB07-74-C-0606)
(AD-A001815; BW-TR-550) Avail: NTIS CSCL 11/2

Plans were made and initial work started on the development of processes for the manufacturing of beryllia substrates for microwave integrated circuits having a surface smoothness not exceeding four microinches per inch by progressive polishing steps. The primary effort centered on studying lapping variables such as pressure, time, abrasive grit size and material on substrate material removal rate and surface smoothness. The first step in the process must provide a flat surface for subsequent polishing while minimizing the degradation of surface smoothness. The results show that 600 grit abrasive, normally used for rough polishing, can be used for this purpose better than other grits examined. GRA

N75-19455# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Macromolecular Science.
POLYMERS WITH UNUSUAL ELECTRICAL PROPERTIES
M. Litt, Che-hsuing Hsu, P. Basu, and T. Noveske 4 Dec. 1974 33 p refs
(Contract N00014-67-A-0404-0011)
(AD-A002440; TR-3) Avail: NTIS CSCL 20/12

Poly(octamethylene dibenzimidazole) is an amorphous polymer. When cast from formic acid, crystalline films of the 1:1 complex of benzimidazole/formic acid are obtained. The crystalline polymer shows large peaks in the dielectric constant and loss factor at 120C which are frequency independent, indicating a first order process. The value of the dielectric constant at the top of the peak is about comparable to values obtained for single crystals of ferroelectric substances. Such films also store large amounts of charge on being poled, and exhibit spontaneous current flow and voltage. The variation of the magnitudes of the current, charge, and voltage as a function of

time and temperature are discussed, and a rationale is presented for the observed phenomena. There is a reasonable probability that the formic acid complex is ferroelectric. GRA

N75-19456# National Bureau of Standards, Washington, D.C. Inst. for Materials Research.
INFLUENCE OF NORMAL ALCOHOLS ON THE ABRASIVE WEAR OF GLASS Interim Report, 1 Jul. 1973 - 30 Jun. 1974
S. M. Wiederhorn and D. E. Roberts Jul. 1974 46 p refs Sponsored by ONR
(NR Proj. 032-535)
(AD-A002289; NBSIR-74-569) Avail: NTIS CSCL 11/2

Normal alcohols were used as lubricants in a study of friction and wear of soda lime silicate glass against silicon carbide. Abrasion surfaces were 600 grit silicon carbide paper and a roughened plate of hot-pressed silicon carbide. Generally, as the abrasion time or the alcohol chain length increased, the coefficient of friction decreased. This result was attributed to better lubrication of the abrading surfaces by the long chain length alcohols. The wear rate and the coefficient of friction were strongly dependent on pullout of carbide grains from the silicon carbide paper. Wear on fresh abrasive paper was independent of alcohol chain length. As the paper becomes used, long chain length alcohols were more effective cutting fluids. For all conditions, the highest wear rate and coefficient of friction were obtained in water. Data are explained in terms of classical theories of friction and wear. GRA

N75-19457# Army Foreign Science and Technology Center, Charlottesville, Va.
SECONDARY ELECTRON EMISSION OF CERTAIN CERAMICS AND ANTIDYNATRON COATINGS
Yu. G. Malynin 30 Jun. 1974 5 p refs Transl. into ENGLISH from Tr. Mosk. Energ. Inst. (USSR), no. 108, 1972 p 85-87
(AD-A002649; FSTC-HT-23-594-74) Avail: NTIS CSCL 11/2

The possibility of reducing the coefficient of secondary electron emission of aluminum oxide ceramics by applying coatings of boron nitride-vanadium oxide to their surfaces was investigated. Data are presented showing that the values of the coefficient for these ceramics, used in power taps of powerful superhigh frequency devices are dangerously high, with respect to increase in secondary electron discharge. Coatings with various proportions of boron nitride and V2O5 effectively reduce the coefficient of secondary electron emission. GRA

N75-19301 Ernst Leitz G.m.b.H., Optischewerke, Wetzlar (West Germany).
THE INFLUENCE OF SPACE PROCESSING ON GLASS TECHNOLOGY
K. Deutscher *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 185-190 refs (For availability see N75-19285 11-12)

N75-19302* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SPACE PROCESSING OF CERAMIC MATERIALS
C. H. Savage and M. H. Leipold *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 191-197 refs (For availability see N75-19285 11-12)
(Contract NAS7-100)

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power*, *20 Spacecraft Propulsion and Power*, and *44 Energy Production and Conversion*.

N75-19458 State Univ. of New York, Buffalo.
KINETIC PARAMETER DETERMINATION BY CATALYTIC WIRE TECHNIQUES Ph.D. Thesis
Charles George Rader 1974 175 p
Avail: Univ. Microfilms Order No. 75-1510

A critical review of previous attempts to determine kinetic parameters by the heated-filament experimental technique is presented. The lack of internal consistency of these early attempts has led to the following conclusion: (1) the Taylor series expansion of the exponent in the Arrhenius rate constant is inappropriate in the representation of the ignition phenomenon on electrically heated wires; (2) a term for the ohmic generation of heat within a catalytic wire heated electrically must be included in the overall energy balance; and (3) the resistance due to mass transfer must be included in the phenomenological representation of catalytic ignition. A new method for the determination of the transport coefficients of heat and mass by catalytic wire techniques is presented and discussed. Comparison of these heat and mass transfer data with existing literature data is also provided. Dissert. Abstr.

N75-19459 State Univ. of New York, Stony Brook.
A STUDY IN FLAMMABILITY OF SOLID FUELS Ph.D. Thesis
Coimbatore Ramaswamy Krishna 1974 89 p
Avail: Univ. Microfilms Order No. 74-27789

A small, steady, or spreading flame above a pyrolying solid was investigated. The system is shown to be analyzable with a reasonable and simple mathematical format which preserves the essential characteristics. The endothermic pyrolysis of the solid was described by in-depth volumetric kinetics. A numerical solution of the differential equations showed that, under normal conductive heat transfer conditions, the gas generation rate could be described by a surface pyrolytic law. The combustible gases emerging from the bounding surface of the solid are burnt in an atmosphere containing oxygen. The boundary layer flow was modeled by a stagnant film approximation which permitted the inclusion of the essential nonlinear reaction rate terms in the mathematical description of the flame and the description of extinction phenomena. Numerical integration of the equations was carried out. Oxygen indexes were derived and shown to depend on various kinetic parameters and ambient conditions. The existance of a flame blow-off condition was demonstrated. Conclusions were drawn on the structure of such diffusion flames examined in relation to the flame sheet limit. Dissert. Abstr.

N75-19460*# Rocketdyne, Canoga Park, Calif.
HIGH-TEMPERATURE EARTH-STORABLE PROPELLANT ACOUSTIC CAVITY TECHNOLOGY Final Report
C. L. Oberg, W. S. Hines, and A. Y. Falk May 1974 85 p refs
(Contract NAS9-12524)
(NASA-CR-141688; R-9401) Avail: NTIS HC $4.75 CSCL 21I

Design criteria, methods and data, were developed to permit effective design of acoustic cavities for use in regeneratively cooled OME-type engines. This information was developed experimentally from two series of motor firings with high-temperature fuel during which the engine stability was evaluated under various conditions and with various cavity configurations. Supplementary analyses and acoustic model testing were used to aid cavity design and interpretation of results. Results from this program clearly indicate that dynamic stability in regeneratively cooled OME-type engines can be ensured through the use of acoustic cavities. Moreover, multiple modes of instability were successfully suppressed with the cavity. Author

N75-19461# Lockheed Missiles and Space Co., Palo Alto, Calif.
SOLID ROCKET PROPELLANTS
E. S. Fridenson 1973 10 p Transl. into ENGLISH from the book "Osnovy Raketnoi Tekhniki" Moscow, Voenizdat, 1973 p 139-153
Avail: NTIS HC $3.25; National Translations Center, John Crerar Library, Chicago, Illinois 60616

The basic characteristics of solid rocket propellants are discussed along with propellant powders, composite rocket propellants, and their composition. The characteristics discussed include specific gravity, specific thrust, gas temperature in the combustion chambers, and safety factors. M.J.S.

N75-19462# Materials Research Labs., Maribyrnong (Australia).
THE ANALYSIS OF SINGLE-BASE PROPELLANT COMPOSITIONS USING GAS LIQUID CHROMATOGRAPHY
A. G. Kelso Nov. 1974 8 p refs
(MRL-TN-358) Avail: NTIS HC $3.25

A method suitable for the simultaneous determination of dinitrotoluene, diphenylamine and dibutyl phthalate in propellant compositions, using gas-liquid chromatography (GLC) after separation from propellant base, is described. 2,4,6-Trinitrotoluence is used as an internal standard for quantitative analysis. The results obtained from propellant samples by using the GLC method are compared with those obtained using classical methods. The analysis may readily be extended to include other propellant components such as ethyl centralite and di-2-ethylhexyl phthalate. Author

N75-19463# Materials Research Labs., Maribyrnong (Australia).
SOME PROPERTIES OF N-NITROSODIPHENYLAMINE RELEVANT TO ITS DETERMINATION IN PROPELLANTS
R. G. Davidson Nov. 1974 22 p refs
(Rept-609) Avail: NTIS HC $3.25

The properties of N-nitrosodiphenylamine (NNDPA) in situations commonly encountered during analysis of propellants are examined. Solutions of NNDPA in ethanol and dichloromethane are shown to be unstable in the presence of light and impurities in the solvents. In solvent extraction work, NNDPA is found to be stable in refluxing distilled dichloromethane in the dark, but not in daylight. Reports that NNDPA is denitrosated in the gas chromatography are confirmed but the reaction, though reproducible, is not stoichiometric. NNDPA is found to denitrosate in thin layer chromatography and quantities of diphenylamine were formed which increased when the plate was exposed to ultraviolet radiation before development. Denitrosation of NNDPA when steam distilled from alkali in the presence of either nitrocellulose or dinitrotoluene is confirmed but is not stoichiometric. Author

N75-19464# Naval Weapons Center, China Lake, Calif.
AXIAL MODE, INTERMEDIATE FREQUENCY COMBUSTION INSTABILITY IN SOLID PROPELLANT ROCKETS Final Report
G. L. Dehority and E. W. Price Oct. 1974 81 p refs
(UF31332303)
(AD-A001677; NWL-TP-5654) Avail: NTIS CSCL 21/9

A one-dimensional analysis of pressure and velocity-coupled driving of a standing wave is presented. In the model it is assumed that each incremental propellant surface area is a possible source of combustion driven wavelets. The wavelets are separated into components in phase or 90 degrees out-of-phase with the standing wave and the driving obtained by summing up the in-phase response over the complete burning surface. GRA

N75-19465# California Inst. of Tech., Pasadena. Guggenheim Jet Propulsion Center.
T-BURNER TESTING OF METALLIZED SOLID PROPELLANTS Final Report, 1 Oct. 1973 - 31 Aug. 1974
F. E. C. Culick Oct. 1974 274 p refs
(Contract F04611-74-C-0005)
(AD-A001665; AFRPL-TR-74-28) Avail: NTIS CSCL 21/9

In 1969, the Committee on Standardization of Combustion Instability Measurements in the T-Burner, an ad hoc committee organized by the ICRPG Working Group on Solid Propellant Combustion, produced the 'T-Burner Manual' (C.P.I.A. Publication No. 191). That report was restricted to experience gained in testing propellants not containing a metal. During the last few years, considerable use has been made of the T-burner for testing metallized propellants. It is the first purpose of this report to summarize much of that work, and to recommend as far as possible standard procedures. GRA

N75-19466# Fulmer Research Inst., Ltd., Stoke Poges (England).
THERMODYNAMIC INVESTIGATION OF COMPOUNDS IN ROCKET PROPULSION Final Scientific Report, 1 Jan. 1972 - 30 Jun. 1974
C. Hayman, M. C. Stuart, and E. B. Bines Oct. 1974 18 p refs
(Contract F44620-72-C-0039)
(AD-A001845; R-163-50; AFOSR-74-1798TR) Avail: NTIS CSCL 07/4

The enthalpy of formation of alpha 1 tungsten hexachloride has been determined calorimetrically by combustion of the metal in chlorine under pressure. Differential scanning calorimetry has been used to derive enthalpy changes for the transitions alpha 1 alpha 2 and alpha 2 - beta in WCl6. Calorimetric measurements have also been made for the determination of the enthalpies of formation of alpha and beta silicon nitrides by combustion in fluorine. It was not possible to progress this work to completion, but a preliminary estimate of the enthalpy of formation of beta-Si3N4 has been made. GRA

N75-19467# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PROBLEMS OF THE THERMODYNAMIC EQUILIBRIUM OF OUTFLOWING COMBUSTION PRODUCTS
V. V. Kleimenov, V. M. Maltsev, V. A. Seleznev, and P. F. Pokhil 12 Nov. 1974 11 p refs Transl. into ENGLISH from the book "Gorenie i Vzryv" Moscow, Izd vo Nauka, 1972 p 426-429
(AD-A001864; FTD-HT-23-1937-74) Avail: NTIS CSCL 07/4

The goals of the present study were to measure translatory temperature, identify the radiation spectrum of a stream of combustion products from condensed systems behind the edge of the nozzle in a model engine, and establish the equilibrium condition of the system, provided it exists. The radiation spectrum of combustion products flowing from a model jet engine nozzle was studied for ballistite H powder and a composition of H-5% aluminum for two engine operating modes: incomplete (20-30 at) and complete (80-90 at). GRA

N75-19468# Utah Univ., Salt Lake City. Dept. of Chemical Engineering.
ABSORPTION SPECTRA OF HIGH-TEMPERATURE SOLID PROPELLANT FLAMES Final Report, 1 Jan. 1973 - 30 Jun. 1974
Richard M. Gross, Norman W. Ryan, and Alva D. Baer Aug. 1974 296 p refs
(Grant AF-AFOSR-2470-73; AF Proj. 6813)
(AD-A001819; AFOSR-74-1905TR) Avail: NTIS CSCL 07/4

A new, high-temperature, infrared radiation source was used in conjunction with a rapid-scanning spectrometer to obtain absorption spectra at an 800 percent rate from composite solid propellant flames during both constant and varying pressure. The propellants studied were AP-HTPB composites. The 3.17 micron H2O, 4.26 micron CO2, and 4.72 micron CO absorption bands were calibrated so that the time-dependent variations in the gas phase concentration of these combustion products could be measured. High-frequency oscillations (200-300Hz) were present even in constant pressure tests and are believed to be associated with inhomogenieties along the optical path length in the flame. During forced oscillation pressure tests at frequencies of 20 to 100 Hz., the composition and temperature of the propellant flame oscillated in phase with the pressure. A study of the variation in the absorption spectra for the major combustion products indicates that prior interpretations of flame emission data during transient pressure conditions were incorrect; however, a principal conclusion of this earlier study was confirmed. Significant gas phase composition variations are produced by pressure changes. GRA

N75-19469# Army Foreign Science and Technology Center, Charlottesville, Va.
THE EFFECT OF CHROMIUM 6 COMPOUNDS ON THE STABILITY OF CONCENTRATED AQUEOUS SOLUTION OF AMMONIUM NITRITE
A. S. Popovich, A. A. Shidlovskiy, and L. F. Shmagin 9 Nov. 1973 7 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Khim. Khim. Tekhnol. (USSR), no. 6, 1968 p 627-629
(AD-A002641; FSTC-HT-23-1481-73) Avail: NTIS CSCL 19/1

Ammonium nitrite is highly unstable, both in a dry state and in concentrated aqueous solutions. When such solutions are used industrially they are normally stored at a pH of 8 - 9 and a temperature of 5 C or less. The effect of additions of chromium compounds on the decomposition of ammonium nitrite solutions was studied, under isothermic and non-isothermic conditions. It was found that such compounds catalyze the decomposition of ammonium nitrite more intensely than HCl. This led to the conclusion that contamination by even small amounts of such compounds should be carefully avoided in

industrial work with ammonium nitrite solutions in order to minimize the danger of explosive decomposition. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N75-19470 Polish Academy of Sciences, Warsaw.
ROUGHNESS OF A TREATED SURFACE AS A DIAGNOSTIC SIGNAL [CHROPOWATOSC OBRABIANEJ POWIERZCHNI JAKO SYGNAL DIAGNOSTYCZNY]
Jerzy Wicher 23 Jun. 1974 15 p refs In POLISH
(Rept-54/1974) Avail: Issuing Activity

Investigations carried out on machine tools (concerning planning, production, and usage) were divided into investigations into large media controlled by a unique measuring apparatus and by trained personnel, and into investigations beyond these media using simple technical agents. The goals of investigations into diagnostic signals are presented along with the parameters of milling machines, noise measurements, correlation analysis, and statistical analysis of the measurement results.
Transl. by M.J.S.

N75-19471 Newark Coll. of Engineering, N.J.
THE THEORY OF MULTIPLE MEASUREMENTS TECHNIQUES IN DISTRIBUTED PARAMETERS SYSTEMS Ph.D. Thesis
Babajimi Claudius Okunseinde 1974 216 p
Avail: Univ. Microfilms Order No. 74-28993

A comprehensive theory of multiple measurements for the optimum on-line state estimation and parameter identification in a class of noisy, dynamic distributed systems, is developed. Often in practical monitoring and control problems, accurate measurements of a critical variable are not available in a desired form or at a desired sampling rate. Rather, noisy independent measurements of related forms of the variable may be available at different sampling rates. Multiple measurements theory involves the optimum weighting and combination of different types of available measurements. The analysis of distributed systems often requires the establishment of monitoring stations. Another contribution of this study is the development of a measurement strategy, based on statistical experimental design techniques, for the optimum spatial monitoring stations in a class of distributed systems. Dissert. Abstr.

N75-19472*# North Carolina Science and Technology Research Center, Research Triangle Park.
INDUSTRIAL NOISE CONTROL: SOME CASE HISTORIES, VOLUME 1
Franklin D. Hart (North Carolina State Univ.), C. Leon Neal, and F. O. Smetana (North Carolina State Univ.) Aug. 1974 43 p refs
(Contract NASw-2490)
(NASA-CR-142314; STR-504-Vol-1) Avail: NTIS HC $3.75 CSCL 13H

A collection of solutions to industrial noise problems is presented. Each problem is described in simple terms, with noise measurements where available, and the solution is given, often with explanatory figures. Where the solution rationale is not obvious, an explanatory paragraph is usually appended. As a preface to these solutions, a short exposition is provided of some of the guiding concepts used by noise control engineers in devising their solutions. Author

N75-19473# Oak Ridge National Lab., Tenn.
CRYOGENIC POWER TRANSMISSION TECHNOLOGY: CRYOGENIC DIELECTRICS Quarterly Report, 1 Apr. - 30 Jun. 1974
Sep. 1974 31 p refs
(Contract W-7405-eng-26)
(ORNL-TM-4711) Avail: NTIS HC $3.75

The major experimental progress during the previous quarter involved completion of the negative polarity dc breakdown measurements up to gaps of 2.5 mm (120 kV) in slowly boiling liquid helium, and final reduction and statistical analysis of the entire set of positive and negative dc breakdown data. Results indicate that the dc breakdown strength with sphere-plane electrodes is systematically lower for negative polarity and gaps ranging from 0.25 to 2.50 mm. The average and minimum breakdown fields appear to saturate at values near 400 kV/cm respectively, for gaps greater than 2.00 mm. Progress was continued in preparations for ac breakdown measurements in liquid helium, and a few preliminary data points were taken. Further tests were carried out on the Hipotronics 700 kVac test set. An open high voltage winding was found in transformer B. Repairs were made, but have proved to be only temporarily successful. Final design drawings were prepared for the 1.2 m diameter high voltage cryostat. Author (NSA)

N75-19474# Naval Research Lab., Washington, D.C.
HYDROGEN PEROXIDE TANK SAFETY Final Report
Robert N. Hazlett, Jack P. Stone, and James M. Hall Nov. 1974 49 p refs
(AD-A002195; NRL-MR-2921) Avail: NTIS CSCL 07/1

The U.S. Coast Guard has the responsibility for regulating water transport of chemicals in U.S. ports and inland waters. In support of that responsibility, NRL has evaluated the effect of a vigorous fire on a 4,000 gallon aluminum transport container for hydrogen peroxide. Heat transfer calculations show that the bare tank would fail in about five minutes in a fire exposure but that one-inch insulation would protect the tank and contents for at least 30 minutes. Additional calculations, combined with experimental H_2O_2 decomposition rates, predict that the critical self-heat temperature for one-inch insulation, while lower than that for the bare tank, would be acceptable. GRA

N75-19475# Varian Associates, Palo Alto, Calif.
MANUFACTURING METHODS AND TECHNOLOGY MEASURE FOR IMPROVED 18 mm MICROCHANNEL PLATES WITH SOLID BORDER Quarterly Progress Report, 13 Dec. 1973 - 13 Mar. 1974
1974 45 p refs
(Contract DAAB05-73-C-2079)
(AD-A001751; QPR-3) Avail: NTIS CSCL 09/5

The objective of the manufacturing methods and technology measure is to establish capability to manufacture 18 mm microchannel plates with solid borders on a pilot line basis including actual fabrication of engineering samples, and first article samples as specified in the contract. In addition, these production improvements shall include, but are not limited to, automation of chemical processing and electrical testing. This work is directly related to the overall night vision program which is a continuing effort to develop improved night vision goggle devices. During this report period the Engineering Phase of the program was completed. Process engineering efforts and process automation equipment work are discussed. The finalized specification is presented. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking*.

N75-19476 British Broadcasting Corp., Kingswood (England). Research Dept.
SATELLITE BROADCASTING: THE EFFECTS OF FILTER DESIGN UPON THE BANDWIDTH AND ADJACENT CHANNEL SEPARATION REQUIREMENTS FOR FM TELEVISION SIGNALS
N. H. C. Gilchrist Feb. 1975 11 p refs
(BBC-RD-1975/8) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

Experimental work is described which was undertaken to determine the effect of varying the amplitude and group-delay characteristics of the r.f./i.f. filters used in a satellite direct broadcasting FM television system. The transmission system employed 13 MHz per volt frequency deviation of the video signal. Filters at the receiver and at the transmitter were

investigated, along with the significance of the sound subcarrier level in determining adjacent-channel separation requirements. The conclusions are that the receiver filter should be a 4-section type with a bandwidth (to the -3 db points) of 28 MHz. Group-delay correction of the receiver filter results in a small improvement in the sound channel signal-to-noise ratio. The use of a suitable group-delay corrected filter of about 25 MHz bandwidth at the output of each television transmitter gives a useful degree of prozection to a signal in the adjacent channel. It was found that it might be necessary to restrict the level of the sound subcarrier accompanying FM television transmissions to a peak deviation of + or - 2 MHz if planning considerations dictate a channel spacing of 30 MHz or less, with an adjacent-channel protection ratio of -6 db. Author

N75-19477 British Broadcasting Corp., Kingswood (England). Research Dept.

A TRAFFIC INFORMATION SERVICE EMPLOYING TIME DIVISION MULTIPLEX TRANSMISSION

R. S. Sandell and M. W. Harman Feb. 1975 24 p

(BBC-RD-1975/9) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

The use of broadcasting to provide traffic and road information to motorists was investigated. The shortage of frequencies and other problems complicate the provision of such a system, but investigation suggests that a solution is possible if time-division-multiplex operation is used in the transmission of the announcements. A network of low-power transmitters, each having a range of about 30 km, could operate on a single frequency, with co-channel interference being avoided by ensuring that simultaneous transmission by stations within range of each other was prohibited. Each station would only transmit for short periods, during which it would radiate local traffic announcements. The use of a single frequency means that the car receiver could be of simple design, and would not require tuning by the driver. To ensure that only information from the local station was received, a muting circuit in the receiver would operate at a pre-set field strength level, so that when the car had moved beyond the range of a particular station, it would no longer receive information from that source. Author

N75-19478 Pennsylvania State Univ., University Park.

THE EFFECTS OF ARTIFICIAL IONOSPHERIC HEATING ON PARTIAL REFLECTIONS Ph.D. Thesis

William Albert Kissick 1974 129 p

Avail: Univ. Microfilms Order No. 74-28967

A description is given of several theories that make use of a radio wave partially reflected from the D-region of the earth's ionosphere. A new form of pulsed wave interaction experiment is proposed, which utilizes a probing wave that is partially reflected within a region heated by an independent ground based high power RF source. The interaction coefficient then is composed of two parts: one due to the perturbation of the absorption coefficient of the probe and another due to the perturbation of the partial reflection coefficient. The latter yields ionospheric information about the reflection region alone. The effects of self heating on the usual partial reflection experiment are examined. Results obtained here show that this effect can significantly change the results of this experiment. Actual data, which substantiate the predictions, are presented. An analytical electron density synthesis technique is presented for the partial reflection experiment. This reduction method is based on volume reflection theory and makes use of only ordinary mode data.

Dissert. Abstr.

N75-19479 Laboratoire Central de Recherches Thomson-CSF, Orsay (France). Lab. Interaction Lumiere Matiere.

FEASIBILITY OF IMAGING DEVICE USING REMANENT ELECTRO-OPTICAL EFFECTS Final Report [ETUDE DES POSSIBILITES DE REALISATION D'UN IMAGEUR BASE SUR L'EFFET ELECTROOPTIQUE REMANENT]

J. P. Herriau, F. Micheron, and P. BiedCharreton 27 Mar. 1973 94 p refs In FRENCH

(Contract DGRST-72-7-0093)

(LCR-73-230/R/G5) Avail: Issuing Activity

Printed page automatic composition is studied using optical memories. Polycrystalline ferroelectric materials of the titano zirconate of lead and lanthane family are discussed with regard to the variation of remanence vs additive ratio. With nonremanent materials, on-line multimodulators were built for parallel data recording of 13 02 32 tracks at 100 Kbits/s with remanent materials XY composers of 5 X 7 points format with matrix access. The lifetime is limited by crack appearance at electrode intersection. ESRO

N75-19480*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

DIFFERENTIAL PULSE CODE MODULATION Patent Application

Calvin F. Herman, inventor (to NASA) Filed 29 Jan. 1975 25 p

(NASA-Case-MSC-12506-1; US-Patent-Appl-SN-545283) Avail: NTIS HC $3.25 CSCL 17B

A differential pulse code modulation encoding and decoding method and apparatus is presented which is capable of transmission with minimum bandwidth, is not affected by data transition density, requires no direct current response of the transmission link, and suffers from minimal ambiguity in resolution of the digital data. Digital data present in a succession of data bit intervals are differentially encoded so that the information is transmitted as a differential change or lack of change of state of data levels at bit time transition points during successive data bit intervals. The data to be sent are encoded by causing a transition in signal level changes between successive bit time transition points during successive data bit intervals in response to a first digital data level, which may be either digital '1' or digital '0' in the digital data being encoded. When the alternate digital data level from the first digital data level is present in the data being encoded, no transition in signal level changes between successive bit time transition points is present. The data so encoded is transmitted, received, and decoded in a decoder. NASA

N75-19481*# Harris Corp., Melbourne, Fla. Electronic Systems Div.

PERFORMANCE ANALYSIS OF WIDEBAND DATA AND TELEVISION CHANNELS Final Report, Feb. 1974 - Jan. 1975

J. M. Geist 31 Jan. 1975 211 p refs

(Contract NAS9-13859)

(NASA-CR-141708; Rept-9300-75-001) Avail: NTIS HC $7.25 CSCL 17B

Several aspects are discussed of space shuttle communications, including the return link (shuttle-to-ground) relayed through a satellite repeater (TDRS). The repeater exhibits nonlinear amplification and an amplitude-dependent phase shift. Models were developed for various link configurations, and computer simulation programs based on these models are described. Certain analytical results on system performance were also obtained. For the system parameters assumed, the results indicate approximately 1 db degradation relative to a link employing a linear repeater. While this degradation is dependent upon the repeater, filter bandwidths, and modulation parameters used, the programs can accommodate changes to any of these quantities. Thus the programs can be applied to determine the performance with any given set of parameters, or used as an aid in link design. Author

N75-19482# Japan Broadcasting Corp., Tokyo. Radio-Frequency Engineering and Satellite Broadcasting Research Group.

SHF FM RECEIVER FOR SATELLITE BROADCASTING

Yoshihiro Konishi, Norio Hoshino, and Katsuaki Uenakada Sep. 1974 10 p refs

(NHK-Labs-Note-180) Avail: NTIS HC $3.25

A satellite broadcast receiving set that operates in the 12 GHz band is described. A mounted planar circuit is used in this receiver for the down converter. The receiver is also provided with an FM-AM converter for converting the FM signals from the satellite into standard television signals. These two circuit configuration techniques constitute an effective means of rendering the receiver highly sensitive but ensuring low cost. These techniques, in fact, have made possible the manufacture of excellent receivers for satellite broadcasting in the 12 GHz band. Test results indicate, the total noise figure to be 4.5 db in a bandwidths of 180 MHz and 500 MHz respectively with an intermediate frequency of

360 MHz and 1.25 GHz. The differential gain and differential phase of the receiver was less than 5% and 2 deg. Author

N75-19483# Japan Broadcasting Corp., Tokyo. Program Engineering Research Group.
COLOR TELEVISION CAMERA CONTROL BY A MICRO-COMPUTER
Kotaro Wakui, Keinosuke Murakami, Teruo Kawai, and Kenji Ohzeki Sep. 1974 6 p
(NHK-Labs-Note-181) Avail: NTIS HC $3.25

Automatic adjustment techniques were developed for color TV cameras using a small scale control system containing a minicomputer. In this system a single minicomputer controls several color TV cameras used in one outside broadcasting vehicle or one studio by one touch operation. This setup replaces the complicated adjustment setup usually required for color broadcast TV cameras. Author

N75-19484# Japan Broadcasting Corp., Tokyo. Radio-Frequency Engineering and Satellite Broadcasting Research Group.
THE NHK KINUTA SHF EXPERIMENTAL STATION
Taiji Saito, Shiro Itoh, Kenichi Konno, Kenjii Ohmaru, Toshiyuki Kaneki, Toyoaki Hasegawa, and Kouichi Takano Oct. 1974 6 p
(NHK-Labs-Note-182) Avail: NTIS HC $3.25

The NHK Kinuta SHF Experimental Station, established to promote research on SHF broadcasting techniques, is discussed. The transmitting system, transmitters, frequency converters, antenna system, and the wave propagation ranges are described. M.J.S.

N75-19485# Suomalainen Tiedeakatemia, Helsinki (Finland).
DCF 77 GIVING AUTOMATIC TIME MARK
Aarne Ranta Dec. 1974 11 p refs
(Rept-12) Avail: NTIS HC $3.25

The DCF-77 time signal transmitter which transmits time data in a coded form is described. A receiver was designed with a loop antenna, an ACC, and a decoder that gives a one-second-long time mark once an hour suitable for timing of recordings. Author

N75-19486# Danish Research Center for Applied Electronics, Hoersholm.
DISPERSIVE FILTER FOR IMPULSE SMOOTHING PARADOXES IN THEORETICAL OVERSTEERING OF MULTIPLEXERS [DISPERSIVT FILTER TIL IMPULSUDJAEVNING. PARADOKSER OG FORSLAG VEDROERENDE OVERSTYRING AF MAELEINSTRUMENTER]
Jens Wested Oct. 1974 64 p refs In DANISH; ENGLISH summary
(ECR-44) Avail: NTIS HC $4.25

Impulse relationships, paradoxes and theories on filters for smoothing of high dc or ac rectangular spikes in a manner of conservation of impulse energy are considered. If the output pulse is rectangular for all pulse widths only the stagger tuned comb filter fulfil the specifications. However, it was possible to realize specifications for a simple dispersive filter and the main data for a system with multiplexers or transversal filters assuming a block division of the spectra. The blocks were processed differently by an approximative process and finally combined at the filter output. Only structures without loss are discussed. In the practical realization it is assumed that the dispersive filter is cascaded by a wide band amplifier without phase distortion but with a postdistortion of amplitude opposite to the filter attenuation-distortion. Author

N75-19487# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Electrical Engineering.
CODING FOR A COMPUTER NETWORK
Oct. 1974 65 p refs
(TH-74-E-52; ISBN-90-6144-052-1) Avail: NTIS HC $4.25

The application of the block coding version of multiple repetition coding (MRC) in a duplex (noisy feedback) situtation was studied along with the recursive coding version of MRC. A coding strategy is described or memoryless duplex channels, and a search was made for the best rate 0.5 convolutional codes to be used in a data transmission duplex scheme. The estimation procedures of recursive coding are also included. For individual titles, see N75-19488 through N75-19492.

N75-19488 Technische Hogeschool, Eindhoven (Netherlands). Dept. of Electrical Engineering.
CODING FOR DUPLEX CHANNELS
J. P. M. Schalkwijk *In its* Coding for a Computer Network Oct. 1974 10 p refs (For availability see N75-19487 11-32)

Coding strategy for memoryless duplex channels is described that allows each station in turn to transmit at a rate approaching channel capacity, and with a performance corresponding to that of a R=0.5 systematic (convolutional) code. Author (ESRO)

N75-19489 Technische Hogeschool, Eindhoven (Netherlands).
CONVOLUTIONAL CODES
In its Coding for a Computer Network Oct. 1974 6 p refs (For availability see N75-19487 11-32)

A search was conducted on the best rate 0.5 convolutional codes, systematic and nonsystematic, of a given constraint length, to be used in a data transmission duplex scheme. The constraint length is defined as the length of the encoder. A new criterion of optimality, on which a computer search for good convolutional codes can be based, is derived. Codes retrieved using this criterion are presented. ESRO

N75-19490 Technische Hogeschool, Eindhoven (Netherlands).
RECURSIVE CODING
In its Coding for a Computer Network Oct. 1974 5 p refs (For availability see N75-19487 11-32)

It is shown that with suboptimal precoding techniques, the estimation procedure of recursive coding, gives the correct result, so long as the D successive code digits, that start with the code digit to be estimated, contain fewer than D/K errors. ESRO

N75-19491 Technische Hogeschool, Eindhoven (Netherlands). Dept. of Electrical Engineering.
A CODING SCHEME FOR DUPLEX CHANNELS
J. P. M. Schalkwijk *In its* Coding for a Computer Network Oct. 1974 17 p refs (For availability see N75-19487 11-32)

Coding strategy for binary duplex channels is described that essentially matches the performance of a system with two identical binary forward channels using a systematic rate-0.5 convolutional code on each of these channels. This coding strategy achieves the same effect as the direct inversion of the feedback channel. Author (ESRO)

N75-19492 Technische Hogeschool, Eindhoven (Netherlands). Dept. of Mathematics.
BINARY SEQUENCES WITH RESTRICTED REPETITIONS
K. A. Post *In its* Coding for a Computer Network Oct. 1974 9 p refs (For availability see N75-19487 11-32)
(TH-74-WSK-02)

Generating functions are presented for the number of binary sequences, consisting of r zeros and s ones, no bit occurring more than k times in succession. For k=2, a function theoretical analysis is given for the number of sequences containing as many zeros as ones. ESRO

N75-19493# Sandia Labs., Albuquerque, N.Mex.
FAILURE TOLERANT DISTRIBUTION NETWORKS
G. J. Simmons Oct. 1974 51 p refs
(Contract AT(29-1)-789)
(SLA-74-0285) Avail: NTIS HC $4.25

A problem in the design of communication systems, explosive distribution networks, command, and control systems, is to determine those networks having a minimum number of two-way communication links that can tolerate k independent failures of links without degradation of the system. A considerable literature is devoted to the symmetric problem in which the nodes are treated as indistinguishable, i.e., of k-edge connected graphs. This models, for example, an intercom system in which all of the stations are masters, but does not model most problems that arise in the areas mentioned where there is normally a specified originating source for the signal to be distributed by the network. The asymmetric case in which one vertex of the network is distinguished as the source and the other n vertices are considered as outputs. The question of characterizing those

networks (graphs) having the least number of edges L(k,l,n) such that cutting k edges cannot isolate more than 1 output from the source is posed and partially answered. NSA

N75-19494# Sandia Labs., Albuquerque, N.Mex.
CALCULATION OF THE RADIATION PATTERN OF A CONICAL ARRAY OF APERTURE ANTENNAS
A. J. Russo Sep. 1974 21 p refs
(Contract AT(29-1)-789)
(SAND-74-0184) Avail: NTIS HC $3.25

A ray optics code was developed to compute the radiation pattern of axially polarized arrays of cone-mounted antennas. Calculations for bare and plasma-covered cones with rectangular aperture and ring slot antennas are compared with experimental patterns. Author (NSA)

N75-19495# Ohio State Univ., Columbus. ElectroScience Lab.
CLASSIFICATION OF OBJECTS WITH COMPLEX GEOMETRIC SHAPE BY MEANS OF LOW FREQUENCY ELECTROMAGNETIC RESPONSE Interim Report
Y. T. Lin Aug. 1974 112 p refs
(Grant AF-AFOSR-2611-74; AF Proj. 9769)
(AD-A000454; ESL-3815-1; AFOSR-74-1737TR) Avail: NTIS CSCL 17/9

A study of the effectiveness of low frequency electromagnetic responses for identifying objects of complex shape is presented. The linear separability of a large variety of objects such as cubes, cylinders and aircraft were examined. An efficient computational method for modeling the scattering returns from an arbitrarily shaped object was developed. This technique was used to simulate the required radar returns from aircraft without resorting to time consuming and costly experimental measurements. Two classification algorithms, a linear discriminant and a nearest neighbor rule, were used to classify a set of four aircraft models. The performance of classification is presented in terms of the probability of misclassification versus noise level. The effectiveness of the various combinations of electromagnetic features was evaluated. (Modified author abstract) GRA

N75-19496# Raytheon Co., Wayland, Mass. Advanced Development Lab.
MULTIPATH MEASUREMENTS Final Report, 30 Apr. - 15 Aug. 1974
D. G. Armstrong, P. E. Cornwell, and A. H. Greene Aug. 1974 262 p refs
(Contract DAAH01-74-C-0704; ARPA Order 2731)
(AD-A001064; ER74-4316) Avail: NTIS CSCL 20/14

Reported is Phase I of a research task to refine the classical multipath theory. The study completed has culminated in the design of a measurement program which can obtain data on terrain and sea reflection phenomena. The processed data can be used to quantify existing theory to assist in improving the performance of tracking radars operating at low elevation angles. The theory of specular and diffuse reflections is discussed in considerable detail, including the most recent modifications which deal quantitatively with the interaction of specular and diffuse reflection and which also describe the distribution of diffuse reflectivity over the glistening surface. A computer simulation based on the advanced theory is described, and typical results presented. GRA

N75-19497# Illinois Univ., Urbana. Electromagnetics Lab.
NUMERICAL SOLUTIONS TO THE PROBLEMS OF ELECTROMAGNETIC RADIATION AND SCATTERING BY A HOLLOW CYLINDER
William A. Davis and Raj Mittra Oct. 1974 107 p refs
(Contract DAHC04-74-G-0113; Grant
DA-ARO(D)-31-124-71-G77)
(AD-A001116; UIEL-74-10; UILU-ENG-74-2555) Avail: NTIS CSCL 20/14

Numerical techniques for solutions to the problems of electromagnetic radiation and scattering are considered for a finite, hollow, circular cylinder of radius a. The singular-integral equations of electromagnetic scattering theory are derived along with their extensions to thin surfaces and surfaces with edges. In addition, constraints are presented which are necessary for a unique solution to the scattering problems of thin structures. The equations for a finite hollow cylinder are obtained by expanding the field quantities in Fourier series about the cylinder axis giving rise to a separate set of singular integral equations for each harmonic. GRA

N75-19498# Naval Electronics Lab. Center, San Diego, Calif.
A SIMPLIFIED MODE CONVERSION PROGRAM FOR VLF PROPAGATION IN THE EARTH-IONOSPHERE WAVEGUIDE Interim Report
Richard A. Pappert and Linda R. Shockey 1 Oct. 1974 63 p refs
(DNA Proj. NWED-HB-042)
(AD-A002259; NELC-IR-751) Avail: NTIS CSCL 20/14

This report presents a variation of an earlier mode conversion program for numerically determining mode conversion coefficients and mode sums for a waveguide which is inhomogeneous along the direction of propagation (invariance normal to the transmitter receiver line is assumed and reflections due to the horizontal inhomogeneity are neglected). Although somewhat more approximate than the earlier program the present version has the advantage of not requiring a full wave fields program for the height gain calculations and can be implemented with about the same ease as a WKB program. It has one advantage over the WKB formulation and that is that mode numbering along the horizontal inhomogeneity is immaterial. The mode conversion program will yield mode conversion coefficients and a mode sum plot for ground based vertical dipole excitation of the vertical electric field at the ground as a function of distance from the transmitter. Since the mode conversion coefficients are independent of transmitter terminator distance, allowance has also been made for incrementing the latter distance and plotting mode sums for the incremented distances. GRA

N75-19499# Naval Research Lab., Washington, D.C.
COVERAGE PREDICTIONS FOR THE NAVY'S FIXED VLF TRANSMITTERS Final Report
James P. Hauser and F. J. Rhoads Sep. 1974 153 p refs
(NRL Proj. 54R07-22)
(AD-A001701; NRL-MR-2884) Avail: NTIS CSCL 17/2

The report is the eighth in a series which presents signal strength and signal-to-noise ratio predictions for the Navy's fixed very-low-frequency transmitters. Predictions given here are for all four seasons of the year. A new atmospheric noise prediction model used for these predictions is briefly discussed and the meaning of the predictions explained. The report supercedes all previous reports in this series. GRA

N75-19500# Army Communications-Electronics Engineering Installation Agency, Fort Huachuca, Ariz.
DIGITAL TRANSMISSION EVALUATION PROJECT RDS-80 TEST Interim Report, 15 May - 15 Sep. 1974
Harold F. Bower, Edward F. New, David M. Laida, and John C. Tyler 31 Oct. 1974 44 p Prepared in cooperation with Army Electronic Proving Ground and Army Communications Systems Agency, Fort Monmouth, N. J.
(AD-A001686; ACCC-CED-74-DTEP-001) Avail: NTIS CSCL 17/2

The Raytheon RDS-80 digital microwave radio system was tested in back-to-back configuration for determination of transfer parameters to isolate propagation effects in link testing and the development of standard test techniques. The system includes duplex radio and multiplexers and propagates 40.15 Mb/s (600 voice channels) at 11 GHz in each of two orthogonal planes, for a 1200 voice channel total capacity. BER vs RSL characteristics are displayed and analyzed as the primary mode of equipment evaluation. Carrier-to-interference data, multiple hop performance, T-1 line tests, and theoretical predictions are compared and studied. Power spectra is displayed and conclusions are drawn with respect to proposed acceptance criteria for Four Phase Shift Keying equipment. GRA

N75-19501# Syracuse Univ. Research Corp., N.Y.
MOVING PLATFORM FOPEN RADAR PROTOTYPE DEVELOPMENT Final Report
William L. Emeny Jun. 1974 254 p refs
(Contract DAAD05-72-C-0299)
(AD-A002060; LWL-CR-07P-72) Avail: NTIS CSCL 17/9

The report describes work to develop a flying prototype

airborne foliage penetration (FOPEN) Radar. A 140 MHz base station FOPEN radar was mounted in a DC-3 aircraft with the antenna mounted perpendicular to the flight path. Data was gathered which enabled the radar cross section of different types of foliage to be determined. A target of known radar cross section, a corner reflector, was fabricated and used to calibrate the system. Measurements were then made on different types of targets located in the open and concealed by foliage. The targets included the corner reflector, small to large trucks, two artillery pieces, and a UH-1D helicopter both with and without rotor blade movement. In parallel with the data gathering program, a primary signal processor/display system was developed based on the Fast Fourier Transform (FFT), a reliable off-the-shelf minicomputer, and an operators display with interactive graphics. The system was completed and used to process, analyze and display the 140 and 50 MHz data. GRA

N75-19502# Vermont Univ., Burlington. Dept. of Electrical Engineering.
TIME DOMAIN APERTURE ANTENNA STUDY, VOLUME 1 Final Report, 21 Dec. 1972 - 21 May 1974
Morris Handelsman Oct. 1974 137 p refs 2 Vol.
(Contract F30602-73-C-0104)
(AD-A002143; RADC-TR-74-254-Vol-1) Avail: NTIS CSCL 09/5

The purpose was to develop direct time domain models suitable for analyzing and predicting the time domain behavior of reflector/TEM horn antenna systems. Three approaches were developed directly in the time domain suitable for predicting the impulsive radiation for reflector/feed antenna systems. Complete and detailed expressions and formulations are provided and all assumptions and approximations are completely described. Comparisons of the utility of the analytical solutions are provided by comparison with available experimental data for a number of TEM horns and reflector/horn configurations. The results of this research provide a unified and concerted approach for analyzing the radiation v.s. time behavior of aperture type antennas. It has been shown that the approaches developed are theoretically sound and selfconsistent within themselves as well as with C.W. antenna theory. A number of problem areas are identified and recommendations for further study made. GRA

N75-19503# Vermont Univ., Burlington. Dept. of Electrical Engineering.
TIME DOMAIN APERTURE ANTENNA STUDY, VOLUME 2 Final Report, 21 Dec. 1972 - 21 May 1974
Hugh C. Maddocks Oct. 1974 229 p refs 2 Vol.
(Contract F30602-73-C-0104)
(AD-A002144; RADC-TR-74-254-Vol-2) Avail: NTIS CSCL 09/5

This research employs a direct time domain model applicable to aperture antennas of any shape excited by fields of any form in space and time to study theoretically the electromagnetic far fields of a paraboloid reflector when fed by a transverse electromagnetic (TEM) horn antenna. First, the TEM horn antenna is considered as an aperture antenna with an arbitrary excitation V(t) applied to its apex. The time domain model is then applied to determine the electric far fields of the TEM horn, and the theoretical results are compared with published experimental data on a relative basis. Reasonable agreement is obtained. Approximate closed form solutions for the electric far fields of the TEM horn in the azimuth plane are also found. Secondly, the TEM horn is studied in terms of current sheets using the vector potential formulation in order to confirm the approximate closed form solutions found in the azimuth plane using the aperture model. GRA

N75-19504# Auburn Univ., Ala. Dept. of Electrical Engineering.
NUCLEUS FOR AN EXPERIMENTAL ARRAY RADAR OPERATING SYSTEM
J. E. Hawkins, Jr. Sep. 1974 103 p refs
(Contract DAAH01-71-C-1303)
(AD-A002078) Avail: NTIS CSCL 17/9

The paper describes a structure for the NUCLEUS of a real-time process-control operating system. Basic operating system capabilities and services are described. Synchronization and message passing is accomplished by using semaphores. Each NUCLEUS module is described by narrative and flowcharts. The NUCLEUS has been implemented and tested on an SEL 86 real-time computer. Flowcharts and module description are included in this report. Complete documentation for the NUCLEUS consists of this report, along with assembly listings and approximately 4,000 punched cards furnished under separate cover. Other user oriented information about the NUCLEUS will appear later in a User's Manual. GRA

N75-19505# Naval Research Lab., Washington, D.C.
RADIATION PATTERNS OF ANTENNAS AT THE US COAST GUARD RADIO STATION, SAN FRANCISCO, CALIFORNIA Final Report
Richard K. Royce Aug. 1974 177 p refs
(AD-A002190; NRL-MR-2881) Avail: NTIS CSCL 09/5

Electromagnetic radiation pattern shapes were measured for four transmitting and five receiving antennas located at the U.S. Coast Guard Radio Station near San Francisco. All antennas were broadband, operating over a portion of the high frequency band with vertical or horizontal polarization and in one case circular polarization. Contour pattern plots were determined for a number of frequencies over the designed operating frequency range of the antenna. Elevation pattern plots were constructed for a selected number of antennas. A reference or control whip antenna was used to verify measurement results. Information is presented about the relative gain of these antennas. GRA

N75-19506# Naval Electronics Lab. Center, San Diego, Calif.
SYNOPTIC PREDICTION OF METEOROLOGICAL FACTORS AFFECTING TROPOSPHERIC RADIO PROPAGATION Technical Report, 1 Jul. 1973 - 30 Jun. 1974
V. R. Noonkester and H. V. Hitney 1 Oct. 1974 60 p refs
(AD-A001712; NELC-TR-1934) Avail: NTIS CSCL 17/2

Radio-meteorological research since WWII is reviewed. All stages of the information flow from meteorological observations to users of radio-propagation predictions are examined and the need for more oceanic mesoscale observations is stressed. A comprehensive literature search is reported. All stages of the information flow required to provide a naval customer with a timely, useful prediction of anomalous propagation conditions are examined. Problem areas are identified and possible solutions are proposed for each stage of the flow. The effect of oceanic mesoscale circulation on naval radio systems and the ability to deduce representative three-dimensional synoptic patterns over large regions of the oceans from widely spaced radiosonde stations are concluded to be the two most important subjects for future investigation. A method of formulating prediction requirements is proposed. GRA

N75-19507# Florida Univ., Gainesville. Engineering and Industrial Experiment Station.
STATISTICAL ANALYSIS OF A CLASS OF IF CORRELATOR: FM RANGING SYSTEMS Final Report
Marion C. Bartlett and Barry G. Mattox Oct. 1974 45 p refs
(Contract DAAG39-74-C-0039)
(AD-A002011; HDL-TR-039-3) Avail: NTIS CSCL 12/9

A statistical analysis technique for obtaining range responses of IF-correlator FM ranging systems is described under the assumptions of slowly varying, high-index frequency modulation and small propagation delays. It is shown that the range response for a system is determined by the functional relationship between modulation and reference and the envelope of the transmitted power spectrum, which (under the high-index FM assumption) is proportional to the first-order probability density of the modulation. Since statistical techniques are used, time/frequency domain analysis of the IF signal is not required and FM/FM systems or systems which use random modulations are conveniently analyzed. The range response is derived in terms of a sum of weighted quasi-autocorrelation functions which have been translated along the delay axis. The displacements and weightings depend on the harmonic series which describes the IF reference as a function of the frequency modulation. GRA

N75-19508# Datalight, Inc., Bloomfield, Conn.
A SMALL, RUGGED 200 KILOBIT/SECOND LASER COMMUNICATIONS SYSTEM Final Technical Report
Richard J. Wangler, Warren A. Birge, and Charles N. Cole Aug. 1974 71 p Prepared in cooperation with Intern. Laser Systems, Inc., Orlando, Fla.

(Contract DAAB07-72-C-0201; DA Proj. 1X6-63723-D-101) (AD-A001829; ECOM-0201-72-F; R-1054) Avail: NTIS CSCL 17/2

The purpose was to produce an advance developmental model of a tactical optical communication set nomenclatured AN/TVC-4 Small, Rugged, 200-Kilobit/Second Laser Communication System. The AN/TVC-4 system consists of a pair of terminals that can be operated in a full-duplex mode at any data rate from 240 bits per second (bps) to a maximum of 200 kilobits per second (kbps). The system is required to operate with an error rate of less than 1 bit in 1,000,000 bits 0.000,001 over a 3-km path with a path attenuation of 10 db per kilometer. In addition to the data mode, the AN/TVC-4 also can function as an analog voice link. The complete transceiver terminal -- which uses a GaAs laser diode source and an avalanche photodetector -- is housed in a rugged 7-in.-wide x 7-in.-high x 7.5-in.-deep package. The report describes in detail the system design, component selection and performance analysis of the fabricated AN/TVC-4 system as well as field test results obtained with the equipment. GRA

N75-19509# Naval Electronics Lab. Center, San Diego, Calif.
FIBER OPTICS DATA BUS SYSTEM (PRESENTS CURRENT STATE OF THE ART IN THE SUITABILITY OF FIBER OPTICS FOR MULTITERMINAL DATA COMMUNICATIONS) Annual Technical Report, Feb. 1973 - Aug. 1974
H. F. Taylor, W. M. Caton, and A. L. Lewis 26 Aug. 1974 26 p refs
(NR Proj. 288-001; RF54545102)
(AD-A002222; NELC-TR-1930) Avail: NTIS CSCL 17/2

Progress is described towards realization of a multiterminal fiber optics data bus capable of handling the information flow requirements of a modern military aircraft. Major accomplishments include development of novel access couplers containing a glass block with an internal mirror, and sensitive optical receivers using a field-effect transistor to amplify the integrated current output from a silicon photodiode. A five-terminal, unidirectional data bus system designed for 5 Mb/s operation was successfully demonstrated. GRA

N75-19510# Army Missile Research, Development and Engineering Lab., Redstone Arsenal, Ala. Advanced Sensors Directorate.
TRACKING ACCURACY OF AN INCOHERENT OPTICAL CORRELATION TECHNIQUE
R. F. Russell and C. P. Callaway 15 Aug. 1974 20 p refs
(DA Proj. 1M2-63306-D-007)
(AD-A001680; RE-75-2) Avail: NTIS CSCL 17/7

This report presents the results of an investigation of the effect of nutation radius on the tracking accuracy of an incoherent optical correlation technique such as the one used in the Terminal Radar Area Correlation Experiment (TRACE). GRA

N75-19511# Rock Island Arsenal Lab., Ill. General Thomas J. Rodman Lab.
ELECTRON BEAM WELDING FOR WEAPON SYSTEM COMPONENTS
Robert D. Busch Dec. 1973 25 p
(AD-A002577; RIA-R-RR-T-3-91-73) Avail: NTIS CSCL 13/8

The utility of the electron beam welding process for the fabrication of weapon components was evaluated. The program included the procurement of an electron beam welder, the training of laboratory and production personnel for its use, and the documentation of welding parameters for the manufacture of selected components. Electron beam welding of the slide track to the receiver shell of the M219 Machine Gun Receiver Assembly was accomplished. GRA

N75-19512# Texas Instruments, Inc., Dallas.
SWITCHABLE MULTICHANNEL SURFACE WAVE DEVICES Final Technical Report, 15 Jan. 1973 - 1 Jul. 1974
R. M. Hays, Jr. Dec. 1974 146 p refs
(Contract DAAB-07-73-C-0094)
(AD-A002562; TI-08-74-70; ECOM-73-0094-F) Avail: NTIS CSCL 09/5

The development of multichannel, frequency-selective filters for UHF application was effectively demonstrated. The demonstration unit provides more than 100 addressable bandpass channels covering the upper 100 MHz of the 225 to 400 MHz UHF communications band with only eleven filters and four distinct filter designs. This implementation of a large number of bandpass filter channels with variable center frequency and/or variable bandwidth with relatively few transducers is made possible through acoustic surface wave technology and a unique engineering approach: the selectable bandpass filter concept. The selectable concept combines two key principles: a tapped surface wave transducer producing a periodic spectrum and electronic switching of the phases on the taps shifting that spectrum in discrete steps in frequency. By cascading several stages of these filters with different spectrum periods and bandwidths, a single channel of a much larger set of available passbands can be addressed by electronically altering the spectrum positions. GRA

N75-19513# United Aircraft Corp., East Hartford, Conn. Research Labs.
VARIABLE ACOUSTIC SURFACE WAVE CORRELATOR Final Report, 14 May 1973 - 13 Jul. 1974
T. M. Reeder and J. L. Swindal Nov. 1974 144 p refs
(Contract DAAB07-73-C-0194; DA Proj. 7X2-63304-D-215)
(AD-A002560; ECOM-73-0194-F) Avail: NTIS CSCL 09/5

The report describes an experimental and theoretical study of nonlinear tapped delay lines for use in electronically variable, radar chirp signal correlation. The devices consist of a hybrid configuration employing a piezoelectric surface acoustic wave delay line whose P equi-spaced taps are wire bonded to an attached, integrated circuit, semiconductor diode array. The device performs as a high speed, real time convolver by use on nonlinear mixing in the diode array. The design, fabrication and test of 51 and 300 tap devices are described which use lithium niobate delay lines and silicon-on-sapphire diode arrays. These devices operate with signal and reference inputs near 120 and 180 MHz. In order to achieve a chirp signal processing bandwidth near 30 MHz, these devices used an unusually small tap spacing, 0.005 inch. A complete theory for the devices is developed and is compared with experimental results for convolution and chirp signal correlation operation with input signals with up to 30 MHz bandwidth. GRA

N75-19514# Army Missile Research, Development and Engineering Lab., Redstone Arsenal, Ala. Advanced Sensors Directorate.
ON THE STATISTICAL ANALYSIS OF THE RADAR SIGNATURE OF THE MQM-34D Interim Report
James W. Wright Jan. 1974 27 p
(DA Proj. 1X3-64307-D-212)
(AD-A002602; RE-75-7; IR-1) Avail: NTIS CSCL 17/9

The report contains the results of an analysis of the radar signature of the MQM-34D target drone near nose-on aspects for a vertically polarized measurements system. The radar cross section and glint are analyzed for monostatic and bistatic conditions and are compared with classical models. GRA

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N75-19515* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
RANDOM PULSE GENERATOR Patent
Reed S. Lindsey, Jr., inventor (to NASA) (Lockheed Electron. Co., Houston, Tex.) Issued 11 Feb. 1975 8 p Filed 25 Jun. 1973 Supersedes N73-26199 (11 - 17, p 2003) Sponsored by NASA
(NASA-Case-MSC-14131-1; US-Patent-3,866,128; US-Patent-Appl-SN-373588; US-Patent-Class-328-59; US-Patent-Class-307-260; US-Patent-Class-324-78J; US-Patent-Class-331-78) Avail: US Patent Office CSCL 09E

An exemplary embodiment of the present invention provides a source of random width and random spaced rectangular voltage pulses whose mean or average frequency of operation is controllable within prescribed limits of about 10 hertz to 1 megahertz. A pair of thin-film metal resistors are used to provide a differential white noise voltage pulse source. Pulse shaping and amplification circuitry provide relatively short duration pulses of constant amplitude which are applied to anti-bounce logic circuitry to prevent ringing effects. The pulse outputs from the anti-bounce circuits are then used to control two one-shot multivibrators whose output comprises the random length and random spaced rectangular pulses. Means are provided for monitoring, calibrating and evaluating the relative randomness of the generator. Official Gazette of the U.S. Patent Office

N75-19516* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DISH ANTENNA HAVING SWITCHABLE BEAMWIDTH Patent
Richard F. Schmidt, inventor (to NASA) Issued 11 Feb. 1975 9 p Filed 10 Sep. 1973 Supersedes N73-32116 (11 - 23, p 2764)
(NASA-Case-GSC-11760-1; NASA-Case-GSC-11783-1; US-Patent-3,866,233; US-Patent-Appl-SN-395868; US-Patent-Class-343-761; US-Patent-Class-343-781; US-Patent-Class-343-837) Avail: US Patent Office CSCL 09E

A switchable beamwidth antenna includes a concave parabolic main reflecting dish which has a central circular region and a surrounding coaxial annular region. A feed means selectively excites only the central region of the main dish via a truncated subreflector for wide beamwidth or substantially the entire main dish for narrow beamwidth. In one embodiment, the feed means comprises a truncated concave ellipsoid subreflector and separate feed terminations located at two foci of the ellipsoid. One feed termination directly views all of the main dish while the other feed termination, exciting the main dish via the subreflector, excites only the central region because of the subreflector truncation. In the another embodiment, the feed means comprises one feed termination and a convex hyperboloid subreflector via which the feed excites the main dish.
Official Gazette of the U.S. Patent Office

N75-19517* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
X-Y ALPHANUMERIC CHARACTER GENERATOR FOR OSCILLOSCOPES Patent
Donald C. Lokerson and Ronald E. Boston, inventors (to NASA) Issued 11 Feb. 1975 8 p Filed 14 Sep. 1973 Supersedes N73-32120 (11 - 23, p 2765)
(NASA-Case-GSC-11582-1; US-Patent-3,866,210; US-Patent-Appl-SN-397477; US-Patent-Class-340-324AD; US-Patent-Class-178-15; US-Patent-Class-315-18) Avail: US Patent Office CSCL 09A

A method and apparatus is disclosed by which any general purpose external trigger laboratory oscilloscope can be utilized to display alphanumeric characters. Each character to be displayed is composed of a plurality of segments appearing at various segment positions in various segment rows to define a conventional matrix. In between character segments to be displayed, or when no display is desired, the trace is effectively blanked by a vertical clamping voltage so as to position the oscilloscope trace in an off-screen position. The clamping technique of the invention, i.e., biasing the oscilloscope trace to an off-screen position when no character segment is to be displayed; it eliminates the necessity of providing Z-axis modulation to effect blanking. Official Gazette of the U.S. Patent Office

N75-19518* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SIGNAL CONDITIONING CIRCUIT APPARATUS Patent
Vard B. Holland, inventor (to NASA) Issued 18 Mar. 1975 3 p Filed 5 May 1971 Supersedes N72-10205 (10 - 01, p 0031)
(NASA-Case-ARC-10348-1; US-Patent-3,872,395; US-Patent-Appl-SN-140439; US-Patent-Class-330-86; US-Patent-Class-330-69) Avail: US Patent Office CSCL 09C

A signal conditioning circuit is described including operational amplifier, a variable source of offset potential, and four resistive impedance. The circuit has constant input impedance independent of gain and offset adjustments. Gain change is effected by varying one of the impedances in an amplifier feedback circuit; offset adjustment is effected through variation of the offset potential source. Official Gazette of the U.S. Patent Office

N75-19519* National Aeronautics and Space Administration. Pasadena Office, Calif.
SYSTEM FOR GENERATING TIMING AND CONTROL SIGNALS Patent
Marvin Perlman (JPL), William J. Rousey (JPL), and Alan Messner, inventors (to NASA) (JPL) Issued 11 Feb. 1975 76 p Filed 26 Dec. 1972 Supersedes N73-18225 (11 - 09, p 1008)
Sponsored by NASA
(NASA-Case-NPO-13125-1; US-Patent-3,866,022; US-Patent-Appl-SN-319150; US-Patent-Class-235-92DM; US-Patent-Class-235-92R; US-Patent-Class-235-92LG; US-Patent-Class-235-92VA; US-Patent-Class-235-92T) Avail: US Patent Office CSCL 09C

A system capable of generating every possible data frame subperiod and delayed subperiod of a data frame of length of M clock pulse intervals (CPIs) comprised of parallel modulo-m sub i counters is presented. Each m sub i is a prime power divisor of M and a cascade of alpha sub i identical modulo-p sub i counters. The modulo-p sub i counters are feedback shift registers which cycle through p sub i distinct states. Every possible nontrivial data frame subperiod and delayed subperiod is derived and a specific CPI in the data frame is detected. The number of clock pulses required to bring every modulo-p sub i counter to a respective designated state or count is determined by the Chinese remainder theorem. This corresponds to the solution of simultaneous congruences over relatively prime moduli.
Official Gazette of the U.S. Patent Office

N75-19520* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DIODE-QUAD BRIDGE CIRCUIT MEANS Patent
Dean R. Harrison and John Dimeff, inventors (to NASA) Issued 4 Mar. 1975 9 p Filed 22 Apr. 1974 Supersedes N74-26760 (12 - 16, p 1895) Continuation-in-part of abandoned US Patent Appl. SN-209618, filed 20 Dec. 1971
(NASA-Case-ARC-10364-3; US-Patent-3,869,676; US-Patent-Appl-SN-462844; US-Patent-Class-329-204; US-Patent-Class-307-321; US-Patent-Class-324-DIG.1; US-Patent-Class-329-166; US-Patent-Class-332-47; US-Patent-Appl-SN-209618) Avail: US Patent Office CSCL 09C

A transducer and frequency discriminator circuit is described including a four-terminal circulating diode bridge, a first pair of capacitors connected in series across two terminals of the bridge, and a second pair of capacitors, or other impedance elements, connected in series across the other two terminals of the bridge. A source of balanced alternating electrical energy for energizing the circuit is coupled between the commonly connected plates of the first pair of capacitors and the commonly connected plates of the second pair of capacitors. Due to the operation of the diode bridge, the sum of the resultant charges developed on the first pair of capacitors is proportional to the relationship between the respective capacitors of the second pair, and consequently, an output voltage taken across the first pair of capacitors will be proportional to that relationship.
Official Gazette of the U.S. Patent Office

N75-19521* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
VOLTAGE MONITORING SYSTEM Patent
Carl L. Canicatti, inventor (to NASA) Issued 4 Mar. 1975 6 p Filed 6 Apr. 1973 Supersedes N73-23290 (11 - 14, p 1640)
(NASA-Case-KSC-10736-1; US-Patent-3,869,667; US-Patent-Appl-SN-348787; US-Patent-Class-324-113; US-Patent-Class-324-102) Avail: US Patent Offike CSCL 09E

A description is given of a system for monitoring the voltage at a remote location and determining when the voltage exceeds upper and lower levels. The system includes transmission lines for transmitting the voltage back to a central station and applying such to an amplifier having a pair of outputs. One of

the outputs of the amplifier is applied to an oscillograph. The other output is fed through an isolation transformer, a full wave rectifier, to a pair of unijunctional transistor circuits for producing pulses when the voltage exceeds or drops below a predetermined level. These pulses, in turn, energize a relay which turns on the oscillograph for recording the voltages being monitored.
Official Gazette of the U.S. Patent Office

N75-19522* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CONTROLLABLE HIGH VOLTAGE SOURCE HAVING FAST SETTLING TIME Patent
Henry Doong and Mario H. Acuna, inventors (to NASA) Issued 4 Mar. 1975 6 p Filed 19 Mar. 1974 Supersedes N74-19853 (12 - 11, p 1269)
(NASA-Case-GSC-11844-1; US-Patent-3,869,659; US-Patent-Appl-SN-452761; US-Patent-Class-321-15; US-Patent-Class-307-227; US-Patent-Class-324-32) Avail: US Patent Office CSCL 09E

A high voltage dc stepping power supply for sampling a utilization device such as an electrostatic analyzer has a relatively fast settling time for voltage steps. The supply includes a waveform generator for deriving a low voltage staircase waveform that feeds a relatively long response time power supply, deriving a high output voltage generally equal to a predetermined multiple of the input voltage. In the power supply, an ac voltage modulated by the staircase waveform is applied to a step-up transformer and then to a voltage multiplier stack to form a high voltage, relatively poor replica of the input waveform at an intermediate output terminal. A constant dc source, applied to the input of the power supply, biases the voltage at the intermediate output terminal to be in excess of the predetermined multiple of the input voltage. Official Gazette of the U.S. Patent Office

N75-19523 City Univ. of New York.
RESISTANCE n-PORT NETWORKS AND GRAPHS Ph.D. Thesis
Stephen Israel Prigozy 1974 224 p
Avail: Univ. Microfilms Order No. 75-1178

A study of various topics, all related to the synthesis of n-port networks containing only resistances (and no ideal transformers) is presented. Summary data cover: (1) proof that paramountcy is a necessary and sufficient condition for a fourth order singular resistance or conductance matrix to be realized, (2) unproved data on system of planar cononic n-terminal, n-port networks, which have all their accessible terminals arranged in a simple closed curved, (3) realizability boundary concept of a conductance matrix, and (4) degenerate networks.
Dissert. Abstr.

N75-19524* National Aeronautics and Space Administration. Pasadena Office, Calif.
MOTOR RUN-UP SYSTEM Patent
John J. Daeges, inventor (to NASA) (JPL) Issued 18 Feb. 1975 8 p Filed 7 Mar. 1974 Supersedes N74-17949 (12 - 09, p 1031) Sponsored by NASA
(NASA-Case-NPO-13374-1; US-Patent-3,867,677; US-Patent-Appl-SN-449118; US-Patent-Class-318-137; US-Patent-Class-318-167; US-Patent-Class-318-176; US-Patent-Class-318-183) Avail: US Patent Office CSCL 09C

A starting system is described for bringing a large synchronous motor up to speed to prevent large power line disturbances at the moment the motor is connected to the power line. The system includes (1) a digital counter which generates a count determined by the difference in frequency between the power line and a small current generated by the synchronous motor; (2) a latch which stores the count; and (3) a comparator which compares the stored count with a newly generated count to determine whether the synchronous motor is accelerating or decelerating. Signals generated by the counter and comparator control the current to a clutch that couples a starting motor to the large synchronous motor.
Official Gazette of the U.S. Patent Office

N75-19525 Purdue Univ., Lafayette, Ind.
A GENERAL CONTROLLED SOURCE Ph.D. Thesis
David Ross Wilkinson 1974 192 p
Avail: Univ. Microfilms Order No. 74-26797

A circuit element which appears frequently in circuit theory literature is the dependent or controlled source. The ideal device is a two-port of four forms: Voltage Controlled Current Source, Voltage Controlled Voltage Source, Current Controlled Current Source and Current Controlled Voltage Source. Although designs have been proposed for implementing controlled sources, none of these is an accurate model of the two-port device. In particular, the inputs and outputs of the proposed devices are not floating, like those of the ideal two-port. An integrated circuit has been designed which, through various interconnections of its terminals, quite accurately models the ideal two-port controlled sources. Interconnections provide operation as any of the four forms. In each case the floating inputs and outputs of the ideal model have been preserved. Dissert. Abstr.

N75-19526 Stanford Univ., Calif.
SPARK-DISCHARGE SWITCHING OF BISTABLE, WALL-ATTACHMENT FLUIDIC ELEMENTS Ph.D. Thesis
Hanan Geist 1974 205 p
Avail: Univ. Microfilms Order No. 74-27023

A study of the spark-discharge initiated switching mechanism was conducted. High speed Schlieren photography, measurements of switching time, measurements of minimum switching voltage as a function of electrode location, and other qualitative experiments were made. The problems which must be solved before spark-discharge switching can be modeled are described. The potential practical value of spark-discharge switching is also assessed in the light of the results of research. Dissert. Abstr.

N75-19527 Stanford Univ., Calif.
THE THERMALLY-DRIVEN FLUID-LOOP DYNAMO: FIELD REVERSAL, EXTINCTION, AND REGENERATION Ph.D. Thesis
Alan Jerome Stratton 1974 156 p
Avail: Univ. Microfilms Order No. 74-27121

In this study a single disc dynamo is shown to be capable of producing field reversals if a component of magnetic flux of external origin is present or, if a shunt circuit is included and the three components of the system (disc, shunt, and coil) are treated as being electrically distinct. In the former case only a single reversal is possible, and then only if the external flux opposes that produced by the dynamo. In the latter case, solutions showing many reversals are obtained which are similar to those of the Rikitake two-disc system. The assumption of a constant driving torque is characteristic of all disc-dynamo models. The principal purpose of this work has been to formulate and study a dynamo model similar to the disc dynamo but which provides a more physically realistic driving mechanism. To this end, a one-dimensional model for thermal convection has been adapted to the problem. Dissert. Abstr.

N75-19528 Stanford Univ., Calif.
MODELING AND OPTIMUM DESIGN OF TRANSDUCERS FOR A TACTILE SCREEN Ph.D. Thesis
Chi-Shin Wang 1974 96 p
Avail: Univ. Microfilms Order No. 74-27132

A theory for electromechanical transducers made of piezoelectric ceramic and metal layers vibrating in flexure is formulated and studied. Rules for choosing the dimensions of the piezoelectric transducer for the tactile screen used to transfer information to the fingertip in the OPTACON, (OPtical-to-TActile-CONverter) are obtained. Motion of the transducer, either with or without mechanical load, can be factored into two terms. One is an electromechanical factor which depends primarily on the ratio between the piezoelectric ceramic thickness and the metal vane thickness. The other is a mechanical factor independent of the thickness ratio. The total thickness and type of transducer are determined by the mechanical output requirement and available drive voltage. With these set, the ratio of ceramic to metal thicknesses can be optimized for minimum power consumption.
Dissert. Abstr.

N75-19529 Cornell Univ., Ithaca, N.Y.
THE SMALL SIGNAL ADMITTANCE OF THE SCHOTTKY BARRIER BARITT DIODE Ph.D. Thesis
James Greaves Oakes 1974 122 p
Avail: Univ. Microfilms Order No. 74-26299

The small-signal admittance of the Schottky barrier Baritt diode was calculated and compared to experimental results. The current continuity equation and Poisson's equation were integrated across the device width to obtain dc solutions using a Runge-Kutta technique. Boundary conditions on the hole density were established at the Schottky barrier and in the high field region near the reverse biased junction. The resulting values of device admittance agreed well with experimental values for Schottky barrier Baritt diodes, although the hole barrier height chosen controlled the magnitude of peak negative conductance to a large extent. Even with lower hole barrier heights than are normally observed, the negative conductances never equalled those of semiconductor junction Baritt diodes. Operation of these devices above 20 GHz appears unlikely due to the high values of negative Q these devices exhibit. Finally, the increased phase shift of the particle current diffusing across the negative electric field region of the Schottky barrier contact caused higher values of peak negative conductance than those predicted by analyses which neglect the diffusion current. Dissert. Abstr.

N75-19530 Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France). Dept. d'Etudes et de Recherches en Micro-ondes.

THEORETICAL AND EXPERIMENTAL STUDY OF A JUNCTION CIRCULATOR AROUND ITS JUNCTION REGION Final Report [ETUDE THEORIQUE ET EXPERIMENTALE D'UN CIRCULATEUR A JONCTION AU NIVEAU DE SA JONCTION]

L. Thourel, A. Priou, A. Delfour, Z. ChanSongLint, and C. Fournet-Favas Mar. 1974 58 p In FRENCH; ENGLISH summary

(Contract DGRST-72-7-0514)

Avail: Issuing Activity

A computer program was used to describe the behavior of a junction circulator with circular metallization. Below the resonant frequency circulator types using partly magnetized ferrites can be correctly characterized. For other types the insertion losses can be taken into account. An application to two commercial circulators was tested and the characteristics were noted. The program also enabled input impedance variations by electric field mapping and drawing the polar diagrams to be studied. Some explanations are proposed in respect of the bandpass increase and limitations in bandpass appearing in ternary symmetry structures with various metallization shapes. ESRO

N75-19531 Lignes Telegraphiques et Telephoniques, Conflans-Sainte-Honorine (France). Lab. d'Etudes Microelectronique.

COMPATIBILITY STUDY OF AN HF TRANSISTOR LINKED TO A SCHOTTKY DIODE TO OBTAIN ULTRA-FAST COMMUTATION CHARACTERISTICS Final Report [ETUDE DE LA COMPATIBILITE D'UN TRANSISTOR HYPER-FREQUENCE ET D'UNE DIODE SCHOTTKY ASSOCIES EN VUE D'OBTENIR DES CARACTERISTIQUES DE COMMUTATION ULTRA-RAPIDE]

A. Dumetz, G. Dameme, and P. Gabillot Dec. 1973 22 p refs In FRENCH

(Contract DGRST-72-7-0439)

(DTCE/3082) Avail: Issuing Activity

The design of an integration technology for a Schottky diode HF transistor in view of ultrafast commutation characteristics is presented. The presence of the diode perturbs the rise and fall time of the applied signals transmitted by the parasitic capacitance. The corresponding degradation was evaluated and a compromise found for which the retention time was increased by a factor of 30 at the cost of a 20 percent rise/fall time degradation. Various barriers, including Si, Pt, Cr, Mo, were studied. The final barrier choice was SiPt and the final commutation time was 0.6 nanoseconds. ESRO

N75-19532 Lignes Telegraphiques et Telephoniques, Conflans-Sainte-Honorine (France). Lab. d'Etudes Microelectronique.

OPTIMIZATION OF TECHNOLOGIES FOR THE INTEGRATION OF RC CIRCUITS USED IN ACTIVE FILTERS Final Report [OPTIMISATION DES TECHNOLOGIES D'INTEGRATION DE CIRCUIT RC POUR FILTRES ACTIFS]

Michele Moulin 26 Dec. 1973 12 p refs In FRENCH

(Contract DGRST-72-7-0427)

(DSC/3385) Avail: Issuing Activity

Thin film RC circuits for use in active filters are presented. The constraints are a one percent precision to be maintained in the minus 20 to plus 70 C range. Capacitors are made by anodic oxidation of beta/tantalum and resistors from oxynitrurated tantalum. There is thus compensation of the temperature coefficients of the components. The technology for the implementation of both types of components on the same substrate is detailed. ESRO

N75-19533 + Nucletudes, Montreuil (France).

WIDE BAND HIGH FREQUENCY AMPLIFICATION Final Report [RECHERCHES RELATIVES A L'AMPLIFICATION HAUTE FREQUENCE A LARGE BANDE]

Jacques Pigneret and Jean-Jacques Samueli Sep. 1972 53 p In FRENCH

(Contract DGRST-71-7-2830)

Avail: NTIS HC $4.25

A range of solid state linear, wide band, low noise amplifiers for use in telecommunications or pulsed techniques is presented. An extension of the band pass towards dc was performed using multi-octave amplifiers of low and medium power having an iterative structure. The band pass ranges from dc to GHz with drift at input in the order of microvolt/degree C. The ac structures can be used up to a power of one watt in VHF. Graphical results of measurements depict the unequalled characteristics in respect of noise factor, intermodulation, band pass, rise time, linearity, input/output decoupling, standing wave ratio, and reflectometry measurements of input/output impedance. ESRO

N75-19534# Royal Aircraft Establishment, Farnborough (England).

ANALYSIS OF THE OPERATION OF A NEW TYPE OF dc-dc BUCK REGULATOR

A. Capel Dec. 1974 28 p refs Transl. into ENGLISH from ESRO Rept. TN-115 (ESTEC), 1973

(RAE-Lib-Trans-1791; BR46325; ERSO-TN-115-ESTEC) Avail: NTIS HC $3.75

A new type of control loop is presented for a dc-dc step-down, or buck regulator, based on the use of a linear analogue to pulse width modulating converter. This operation, which is independent of operating frequency, permits the use of high sampling frequencies. By using a limiter on the analogue input, an output limited characteristic can be automatically obtained without additional sensing of the line voltage. It is shown that the parameters f sub zero and gamma sub one are independent, and the way in which the loop can be used to control the output characteristics of the regulator is described. The flexibility of this technique is useful in its application to high power systems (1 kW) as it allows several units, in modulator form, to be operated in parallel. Author

N75-19535*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COPPER EMISSIONS FROM A HIGH VOLUME AIR SAMPLER

Robert B. King and John Toma Mar. 1975 9 p refs

(NASA-TM-X-71693; E-8263) Avail: NTIS HC $3.25 CSCL 09A

High volume air samplers (hi vols) are described which utilize a brush-type electric motor to power the fans used for pulling air through the filter. Anomalously high copper values were attributed to removal of copper from the commutator into the air stream due to arcing of the brushes and recirculation through the filter. Duplicate hi vols were set up under three operating conditions: (1) unmodified; (2) gasketed to prevent internal recirculation; and (3) gasketed and provided with a pipe to transport the motor exhaust some 20 feet away. The results of 5 days' operation demonstrate that hi vols can suddenly start emitting increased amounts of copper with no discernible operational indication, and that recirculation and capture on the filter can take place. Copper levels found with hi vols whose exhaust was discharged at a distance downwind were among the lowest found, and apparently provides a satisfactory solution to copper contamination. Author

N75-19536*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

DUAL MODE SOLID STATE POWER SWITCH Patent Application

Louis C. Maus (Sperry Rand Corp.) and Donald E. Williams, inventors (to NASA) Filed 11 Mar. 1975 13 p
(NASA-Case-MFS-22880-1; US-Patent-Appl-SN-557444) Avail: NTIS HC $3.25 CSCL 09A

A power switch is described which operates as a simple saturated switch when the load current is less than a predetermined value, and as a Darlington circuit when an overload or transient condition exists. It comprises a two-stage transistor amplifier connected in a Darlington configuration with a transistor interconnecting the collectors of the transistors, and arranged so that the input transistor and the interconnecting transistor form a compound transistor. By reason of the compound configuration between the transistors, the input impedance of the switch is large and keeps the base current drive of the interstage transistor relatively low. This reduces power losses and increases efficiency. NASA

N75-19537*# Bendix Corp., Sidney, N.Y. Electrical Components Div.
INTERFACIAL INSERT FOR ELECTRICAL CONNECTORS Engineering Report
D. MacAvay 2 Apr. 1975 22 p
(Contract NAS9-13899)
(NASA-CR-141728; Rept-1720) Avail: NTIS HC $3.25 CSCL 09A

The development of interfacial inserts for improved electric connectors is discussed. The inserts were manufactured from epoxy resins. The design features of the inserts and the manufacturing equipment are described. The reliability test program is reported. Drawings of the interfacial inserts are provided. Author

N75-19538# Communications Research Centre, Ottawa (Ontario).
CHARACTERIZATION AND DESIGN OF IPATT DIODES AND ASSOCIATED CIRCUITS Ph.D. Thesis - Queens Univ., Kingston, Ont., Dec. 1973
A. E. Winter Dec. 1974 117 p refs
(CRC-1257) Avail: NTIS HC $5.25

IMPATT diode and microwave circuit interactions at X-band were examined by means of state space techniques. Complexity of circuit formulation is found to limit the usefulness of these techniques. A small-signal lumped model for the IMPATT diode was extended to a nonuniform cross-section chip to obtain the parameters of both the chip model and the package equivalent circuit by computer search. A design procedure is presented for a microstrip IMPATT diode oscillator, and the frequency of operation is predicted to within 3%. The effects of the diode reference plane and the microstrip-to-coaxial-line connector are significant. The gain and phase shift of a coaxial IMPATT diode amplifier was predicted from the lumped model and experimentally verified. Author

N75-19539# Danish Research Center for Applied Electronics, Hoersholm.
POWER TRANSISTORS: A QUALITY SURVEY ON 2N 3055 INCLUDING 11 MAKES OF METAL ENCAPSULATED TO-3 AND THREE MAKES WITH PLASTIC ENCAPSULATION, SIMILAR TO TO-220 [EFFEKTTRANSISTORER: EN KVALITETSVURDERING AF 2N 3055 OMFATTENDE 11 FABRIKATER I METALINDKAPSLING TO-3 OG 3 FABRIKATER I PLASTINDKAPSLING, SUARENDE TIL TO-220]
H. J. Nordby Nov. 1974 61 p In DANISH; ENGLISH summary
(ERC-47) Avail: NTIS HC $4.25

This report covers the investigation of the power transistor type 2N3055 which is one of the most widely used power transistors on the market. The investigation includes 11 makes which are of the commonly known TO-3 encapsulation, and 3 makes which are plastic encapsulated, whereby 12 manufacturers are represented. It has been endeavoured to investigate the transistors life-time at high load and ability to handle large currents. An inspection of the chip shows that there are great differences between the types of chips used by the manufacturers. A great difference in quality is revealed on comparison between the makes. Only one metal encapsulated make can withstand 1000 hr. intermittent operation at high load, while the 3 makes which are plastic encapsulated passed the test without any failures. Author

N75-19540# Danish Research Center for Applied Electronics, Hoersholm.
PROTECTIVE VARNISH FOR MINATURIZED COMPONENTS. STUDIES ON A SERIES OF MULTIPLE COMPONENT MATERIALS FOR SPREADING, DIPPING, POTTING, OR DIPCOATING [BESKYTTELSESLAKKER TIL MINIATUREKOMPONENTER. UNDERSOGELSE AF EN RAEKKE EN- OG FLERKOMPONENTMATERIALIALER TIL SPROJTNING, DYPNING, 'POTTING' OG DRABEDOSERING]
S. T. Olesen Dec. 1974 67 p refs In DANISH; ENGLISH summary
(ECR-48) Avail: NTIS HC $4.25

Insulation varnishes and potting compounds for protection of electronic components and modules are discussed. The report gives process descriptions,description of test results as well as practical examples covering both varnishes as real potting compounds. Author

N75-19541# Danish Research Center for Applied Electronics, Hoersholm.
FAILURE MECHANISMS IN MONOLITHIC INTEGRATED CIRCUITS [FEJLMEKANISMER I MONOLITISKE IC]
Birger Schneider Sep. 1974 88 p refs In DANISH; ENGLISH summary
(ECR-43) Avail: NTIS HC $4.75

An informative description is presented of the most common failure mechanisms which occur in monolithic integrated circuits, particularly in plastic encapsulated components. There is also a brief description of the precautions already being applied, or those which can be applied by the IC producers to reduce the rate and extent of failures. Circuit types to which these improvements can be applied most advantageously are given. Author

N75-19542*# Lowell Technological Inst. Research Foundation, Mass. Dept. of Electrical Engineering.
ANALYSIS OF SELF-OSCILLATING dc-TO-dc CONVERTERS Final Report, Feb. 1973 - Aug. 1974
Peter Burger 31 Aug. 1974 82 p refs
(Grant NGR-22-018-066)
(NASA-CR-136748) Avail: NTIS HC $4.75 CSCL 09E

The basic operational characteristics of dc-to-dc converters are analyzed along with the basic physical characteristics of power converters. A simple class of dc-to-dc power converters are chosen which could satisfy any set of operating requirements, and three different controlling methods in this class are described in detail. Necessary conditions for the stability of these converters are measured through analog computer simulation whose curves are related to other operational characteristics, such as ripple and regulation. Further research is suggested for the solution of absolute stability and efficient physical design of this class of power converters. Author

N75-19543# Sandia Labs., Livermore, Calif.
SUPERCONDUCTING SWITCHES USING RADIATION INDUCED QUENCHING
R. W. Schmieder Oct. 1974 8 p refs
(Contract AT(29-1)-789)
(SLL-74-0223) Avail: NTIS HC $3.25

The use of penetrating radiation such as X-rays or high energy electrons to cause quenching of a superconducting short across an inductive energy store, thereby switching the persistent current into an external load, is examined. The basis equations describing this process within the two-fluid model are presented, and estimates of the size of megampere switches are made. The ratio of switching energy to switched energy is derived, and X-ray vs. electron impact quenching is discussed. Several geometries for practical switches are presented. Author (NSA)

N75-19544# Brookhaven National Lab., Upton, N.Y.
SUPERCONDUCTING ac POWER TRANSMISSION CABLE OF FLEXIBLE DESIGN WITH NIOBIUM-TIN STRIP CONDUCTORS
H. Voight [1975] 22 p refs Transl. into ENGLISH from Elektrotech. Z., A (West Germany), v. 94, no. 5, 1973 p 256-260

Sponsored by ERDA
(BNL-TR-575) Avail: NTIS HC $3.25

The development of a flexible superconducting cable using Nb3Sn is discussed. Its use as a superconducting ac power cable is theoretically discussed in terms of its hysteretic losses. The use of these cables in three-phase transmission is also described. The overload capacity of the Nb3Sn strip conductors is discussed in terms of the critical field and the magnetic field of the conductors. NSA

N75-19545# California Univ., Livermore. Lawrence Livermore Lab.
APPROACHES TO HIGH TEMPERATURE ELECTRONICS
A. S. Blum 16 Oct. 1974 8 p
(Contract W-7405-eng-48)
(UCID-16613) Avail: NTIS HC $3.25

After preliminary investigation, three potentially viable approaches to the problem of constructing high temperature electronic systems (operable to 500 C) have emerged. The three approaches utilize: (1) miniaturized vacuum electronics, (2) 3 and 5 compound semiconductors, and (3) silicon carbide films. Aspects of the development programs for the three different approaches are examined. NSA

N75-19546# Westinghouse Electric Corp., Lima, Ohio. Aerospace Electrical Div.
PROGRAM FOR THE DEVELOPMENT OF A SUPERCONDUCTING GENERATOR. PART 1: PHASE 1 Report for May 1971 - Jan. 1974
R. D. Blaugher, J. L. McCabria, and James H. Parker, Jr. Oct. 1974 243 p refs
(Contract F33615-71-C-1591; AF Proj. 3145)
(AD-A001649; AFAPL-TR-74-84-Pt-1) Avail: NTIS CSCL 10/21

The work included the preliminary studies and design of a 12,000 RPM, 5 MVA, 400 Hz generator with a rotating field. It also includes the individual tests of the most critical components, i.e., the dynamic cryogenic seals, power leads, interconnections of the SC coils, SC field windings, and construction and test of a complete rotor. The cold rotor tests (at 4.2K) were conducted up to the overspeed value of 13,200 rpm. Full excitation of the field (equivalent to 5.32 MVA) was obtained at the operating speed of 12,000 rpm. GRA

N75-19547# Varian Associates, Palo Alto, Calif.
DEVELOPMENT OF A HYBRID TRAVELING WAVE TUBE Final Report, 25 May 1973 - 28 Feb. 1974
A. W. Scott Oct. 1974 76 p refs
(Contract F30602-73-C-0297)
(AD-A001642; RADC-TR-74-236) Avail: NTIS CSCL 09/1

The hybrid TWT developed on the program combines the best features of both the coupled-cavity circuit and the comb-supported ring-bar circuit. The input section and most of the output section uses the comb-supported ring-bar circuit to provide broad bandwidth without oscillations. At the output end of the output section, a short length of coupled-cavity circuit is added; short enough to be stable at its band edges without the need for oscillation suppression. The coupled-cavity circuit is an order of magnitude less lossy than the comb-supported ring-bar circuit. Its use at the end of the output section, where power levels are highest, prevents efficiency degradation. GRA

N75-19548# Naval Postgraduate School, Monterey, Calif.
SOLID STATE X-BAND SWEPT FREQUENCY TRANSMITTER INVESTIGATION M.S. Thesis
Clifford J. Appel Sep. 1974 56 p refs
(AD-A000427) Avail: NTIS CSCL 17/7

The research conducted is an attempt to develop a swept frequency X-band transmitter for use as an aid to navigation. The investigation involves mounting an IMPATT diode in microstrip and stripline circuits to obtain a minimum rf output power of one watt. Provisions for electronic tuning and pulsing are also discussed. Author (GRA)

N75-19549# California Univ., Irvine.
SOPHISTICATED INSTRUCTIONAL ENVIRONMENT FOR TEACHING ELECTRONIC TROUBLESHOOTING Final Report, Jan. 1973 - Mar. 1974
John Seely Brown, Alan G. Bell, and Richard R. Burton Oct. 1974 145 p refs Prepared in cooperation with Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
(Contract F41609-73-C-0006; AF Proj. 112102)
(AD-A002148; AFHRL-TR-74-77) Avail: NTIS CSCL 05/9

The report describes the programming approach used to implement a simulated laboratory training situation in which a student is allowed to troubleshoot a defective regulated power supply. The ways in which students can use English to ask questions about and manipulate the simulated device are described. The techniques developed to recognize English, to simulate the electronic circuit, and to model the student's knowledge about the circuit are explained. A conclusions section explains the generality of the work performed, and possible extensions of the techniques to other training situations. GRA

N75-19550# Army Foreign Science and Technology Center, Charlottesville, Va.
UTILIZATION OF CRYOGENIC TECHNIQUES FOR STORAGE AND TRANSMISSION OF ELECTRICAL ENERGY
I. I. Petrov 12 Aug. 1974 6 p Transl. into ENGLISH from Elek. i Teplovoznaya Tyaga (USSR), no. 1, 1972 p 13-14
(AD-A001732; FSTC-HT-23-126-74) Avail: NTIS CSCL 09/3

The article notes the need for transmitting large amounts of electric power from the main power sources in Siberia and Kazakhstan to the central part of the country and the limitations of existing superhigh voltage power transmission technology, which make it economically or technically impractical to fill the need by existing technology. Development of superconductivity and its application, by cryogenic techniques, to electric power transmission lines, to transmission of electrical energy through superhigh frequency electromagnetic radiation in wave guides and cryogenic energy storage is promising. An illustration and brief discussion of a French cryogenic, zero-resistance storage solenoid are given, and possible use in electricaltraction devices is mentioned. GRA

N75-19551# Illinois Univ., Urbana. Coordinated Science Lab.
THE DESIGN OF MULTIPLE-VALUED ASYNCHRONOUS SEQUENTIAL CIRCUITS Ph.D. Thesis
Stephen James Sheafor Sep. 1974 143 p refs
(Contract DAAB07-72-C-0259)
(AD-A002164; R-663; UILU-ENG-74-2229) Avail: NTIS CSCL 09/2

This thesis examines several areas which are vital to the development of multiple-valued asynchronous sequential circuits. An existing method of designing multi-valued combinational circuits is analyzed in detail, and modifications are presented which extend the applicability of this design to more functions. Storage devices are also examined, and a device is presented which is simple to construct and is useful in the construction of asynchronous circuits. The problem of state assignment for multiple-valued circuits is studied in depth. Methods which minimize the number of state variables are presented, and then analogy to binary row-set and shared-row assignments is demonstrated. An algorithm for producing unicode single transition time assignments is developed, and is shown to produce optimal solutions. Various refinements on this method and other simpler but non-optimal methods is described. GRA

N75-19552# GTE Sylvania, Inc., Mountain View, Calif. Electronic Systems Group.
PROJECT FW/CM ADAPTIVE MEASURE Final Report, 1 May 1973 - 1 May 1974
J. E. Rice and R. G. Baender Sep. 1974 155 p refs
(Contract F30602-73-C -0307)
(AD-A002141; EDL-E214; RADC-TR-74-243) Avail: NTIS CSCL 09/5

The report covers technical investigations and evaluation of system performances as well as the statistical design of large aperture, low sidelobe antenna arrays in the high frequency band of the radio frequency spectrum. The details covered include: (a) measurement and analysis of an existing receive array at Dexter, N.Y.; (b) modification of existing computer software to accept data from the array performance monitor; (c) design, development, and implementation of an array performance monitor for an existing array; (d) analysis of the effect of using a finite radius in making flight checks of an array; (e) design study for

a large aperture, low sidelobe array analysis and design including the statistical effect of errors in construction, design gain, system noise figure and aperture coefficients for constant beamwidth as a function of frequency. GRA

N75-19553# Texas Instruments, Inc., Dallas. Central Research Labs.
SUBMINIATURE BROADBAND FILTERS Final Report, 1 Jul. 1972 - 30 Aug. 1974
Ronald C. Rosenfeld and Clinton S. Hartmann Oct. 1974 63 p refs
(Contract DAAB07-72-C-0326; DA Proj. 1S6-62705-A-057) (AD-A002041; TI-08-74-59; ECOM-72-0326-F) Avail: NTIS CSCL 09/5

Unidirectional acoustic surface-wave filters developed in this program demonstrated only 2-dB insertion loss. This part of the program covered fabrication of air-insulated crossovers with low parasitic capacitance and resistance and development of multiphase and matching networks required by the three-phase unidirectional transducer. A tapered weighted unidirectional filter was also demonstrated. A new weighting technique, the capacitively weighted transducer, was invented. This technique can be used to weight both conventional and unidirectional filters. In addition, this program included initial investigation of the multichannel selectable bandpass filter and the series-weighted filter. GRA

N75-19554# IBM Watson Research Center, Yorktown Heights, N.Y.
THE PHYSICS OF INTERFACE INTERACTIONS RELATED TO RELIABILITY OF FUTURE ELECTRONICS DEVICES Final Report, 1 Aug. 1973 - 31 Jan. 1974
Thomas H. DiStefano and King-Ning Tu 31 Jan. 1974 95 p refs
(Contract F19628-73-C-0006; ARPA Order 2180; AF Proj. 2180)
(AD-A001977; AFCRL-TR-74-0263) Avail: NTIS CSCL 20/12

Contents: The reliability of semiconductor-insulator interfaces--Photon induced dielectric breakdown in SiO2, and Photon assisted tunneling in internal photoemission I. theory; Band structure and switching in metal oxide insulators--Electronic contact barriers and morphology of Nb2O5 thin films, and Electronic structure of the SiO2:Si3N4 interface; Instabilities associated with metal-glass interaction--Surface reactions on MOS structures, Densification of SiO2 by exposure to an ion beam, and Epitaxial growth of Nickel Silicide NiSi2 on Silicon. GRA

N75-19555# Energy Sciences, Inc., Burlington, Mass.
RESONANT TRANSFORMER ELECTRON BEAM PULSER Final Report, 4 Jan. 1973 - 25 Apr. 1974
John J. Moriarty Nov. 1974 90 p refs
(Contract F29601-73-C-0120; AF Proj. 317J)
(AD-A001828; AFWL-TR-74-122) Avail: NTIS CSCL 09/1

A resonant air-core transformer was evaluated theoretically and experimentally as a pulser for an electron beam gun. The analysis has resulted in a set of design parameters which has been used to design a lightweight (approximately 100 kg) pulser for the generation of 150 kV, 40-A pulses of 30-microsec duration at 250 pps in 10-sec bursts. An experimental model has generated 150-kV, 2 to 5-A pulses of 10 to 14-microsec duration at 20 pps in operation limited by the available power supply. Experimental results have been in sufficient agreement with the theory to provide a high level of confidence in the full scale design. The efficiency predicted in the simplified case of decoupled losses varies from 42 percent with resistive charging to 56 percent by reactive charging methods. In general the dc-to-beam efficiency improves as the loading is increased and may approach approximately 60 percent in view of the coupling which realistically exists between loss elements. GRA

N75-19556# Army Missile Research, Development and Engineering Lab., Redstone Arsenal, Ala. Advanced Sensors Directorate.
A BROADBAND QUADRUPLE-RIGED WAVEGUIDE RADIATOR
Fan King, Donald R. Erbach, and James S. Yee 30 Jun. 1974 59 p refs
(DA Proj. 1M3-62303-A-214)
(AD-A002601; RE-74-7) Avail: NTIS CSCL 09/5

The report presents the results of an investigation in the design of a broadband quadruple-ridged waveguide radiator. It covers the theoretical and practical aspects in the design of the ridged waveguide parameters, the design of the ridges in the flared section, and the design of the coaxial to ridged waveguide transformer. The result of the investigation is a - 2 12 GHz bandwidth, dual-polarization, quadruple-ridged horn which is an advancement in the state-of-the-art. GRA

N75-19557# Army Foreign Science and Technology Center, Charlottesville, Va.
ANTENNAS, A COLLECTION, ISSUE 15
L. Sopin, L. Bazelyan, G. Inyutin, V. Narbut, and Y. Zamyatin 15 Jun. 1974 128 p refs Transl. into ENGLISH from Antenny (Moscow), no. 15, 1972
(AD-A002646; FSTC-HT-23-718-74) Avail: NTIS CSCL 09/5

Contents: The theory of two-dimensional arrays with random arrangement of the radiators; Experience in the development of two-dimensional antenna arrays with random arrangement of the radiators; On the three-dimensional structure of cross-polarization radiation of axisymmetrical parabolic antennas; On the problem of reducing directive gain and dispersion of the direction of the principal maximum of the radiation pattern of a sectionalized antenna of a traveling wave; On the problem of the statistics of a field of focussed systems; Directive gain and input impedence of a flat radiator located close to a boundary surface; Analysis of the properties of coupled structures; An evaluation of aircraft capacitor medium wavelength folded-dipole antennas for their efficiency. GRA

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N75-19558 Polish Academy of Sciences, Warsaw.
TWO DIMENSIONAL FLOWS WITH NONEQUILIBRIUM PHASE TRANSITIONS
Magdelena Bratos and Manfred Jaeschke 1974 53 p refs (Rept-58/1974) Avail: Issuing Activity

The influence of nozzle geometries on the structure of the condensation zone in the flow is considered. A condensation model was constructed and used to calculate the values of flow variables. Results indicate: (1) a high sensitivity of the nozzle diabatic flows to the expansion rates, (2) the condensation region appears at a smaller distance from the nozzle throat at the nozzle wall than at the axis; (3) there is a strong correlation between the position and structure of the condensation region and the expansion rate; and (4) the condensation region is more marked along the symmetry axis than along the nozzle wall. M.J.S.

N75-19559 + Engineering Sciences Data Unit, London (England).
PERFORMANCE OF CONICAL DIFFUSERS IN INCOMPRESSIBLE FLOW
[1974] 25 p refs Sponsored by Roy. Aeron. Soc., Inst. of Chem. Engr., Inst. of Mech. Engr., and Inst. of Struct. Engr.
(ESDU-73024) Copyright. Avail: NTIS HC $98.50

Static-pressure recovery and total-pressure loss for flow through conical diffusers are discussed along with the effects of various geometrical and flow parameters on the diffuser performance. The calculation of power requirements for duct and pipe systems such as air or water cooling systems or process plant pipelines was also investigated. Author

N75-19560 Polish Academy of Sciences, Warsaw.
A NUMERICAL METHOD FOR CALCULATING PLANE FLOW OF A VISCOUS LIQUID [O PEWNEJ METODZIE NUMERYCZNEJ WYZNACZANIA PLASKIEGO RUCHU CIECZY LEPKIEJ]

Andrzej Styczek 1974 69 p refs In POLISH
(Rept-31/1974) Avail: Issuing Activity

The determination is discussed of stationary flow of a given plane contour by the flux of a viscous liquid in a given velocity distribution. Other topics discussed include Navier-Stokes equations, linear equations, algorithms, Reynolds number, boundary conditions, iterative solutions, and the Poincare problem. Transl. by M.J.S.

N75-19561 Polish Academy of Sciences, Warsaw.
GRADIENT MODEL OF CAPILLARY EFFECTS [GRADIENTOWY MODEL ZJAWISK KAPILARNYCH]
Andrzej Blinowski 1974 86 p refs In POLISH
(Rept-42/1974) Avail: Issuing Activity

The dependence of free energy on the density gradient, or in the case of multiple media, on the density gradients of all the components, is discussed. The theory presented is generalized from the Mindlin theory, but will be linear and will not be limited to the examination of single-media substances. Other topics discussed include phase equilibrium, superficial phenomena, Laplace transformation, Van Der Waal forces, molecular theory, surface tension, surface chemistry, and Rayleigh approach. Transl. by M.J.S.

N75-19562 Purdue Univ., Lafayette, Ind.
NUMERICAL ANALYSIS OF UNSTEADY COMPRESSIBLE GAS DYNAMICS OF VARIED AREA CHANNELS: APPLIED TO GAS DYNAMIC LASER START Ph.D. Thesis
Harold Walter Gale 1974 129 p
Avail: Univ. Microfilms Order No. 74-26713

A method of characteristics technique for one dimensional unsteady flow with an indefinite number of discontinuities in a varied area channel was developed. The technique is an improvement of the Hartree technique, and has the desirable features of both the grid of characteristics method and the inverse specified solution point method. In the present method the solution points are determined by the intersection of right-running wave characteristics and specified constant time lines. A numerical algorithm for computing internal flows of the type encountered in the start of gas dynamic lasers (GDLs) was developed and programmed. Accuracy studies were conducted. The computer program was used to generate the flow fields for several channel contours resembling GDL ducts. The results reveal the complex nature of such unsteady flows and the general inadequacy of analyses which do not resolve flow discontinuities at shocks and contact surfaces. Dissert. Abstr.

N75-19563 Stanford Univ., Calif.
THE THEORY OF NON LINEAR INTERFACIAL WAVES Ph.D. Thesis
Robert Walter Atherton 1974 225 p
Avail: Univ. Microfilms Order No. 74-26981

The hydrodynamics of falling liquid films were studied through mathematical analysis of the movement of the interface. An asymptotic method for the solution of general moving boundary value problems was formulated, which takes advantage of the disparate length scales existing in the problem and results in a solution of the interior fields in terms of the unknown surface location function. The remaining boundary condition, which constitutes a constraint on the surface location function, then provides an evolution equation. Evolution equations for two dimensional, three dimensional, and cylindrical film flow are derived using asymptotic methods. The concept was developed of model equations as rational approximations to the evolution equation. The inverse problem of the calculus of variations was treated using modern functional analysis. Necessary and sufficient conditions for the existence of variational principle for an arbitrary system of nonlinear differential equations are derived. The model equations for the two dimensional falling liquid film were solved numerically using a split step method. Dissert. Abstr.

N75-19564 Stanford Univ., Calif.
TURBULENT TRANSPORT OF HEAT AND MOMENTUM IN A BOUNDARY LAYER SUBJECTED TO DECELERATION, SUCTION AND VARIABLE WALL TEMPERATURE Ph.D. Thesis
Alcir deFaro Orlando 1974 223 p
Avail: Univ. Microfilms Order No. 74-27073

Stanton number was shown to be the same function enthalpy thickness as customarily used for zero pressure gradient flows. The response of the boundary layer to a step in wall temperature was found to be the same as for a zero pressure gradient flow, and superposition methods based on the step-temperature solution were shown to accurately predict a case of arbitrarily varying wall temperature. Friction factors were also measured but the values were not predictable by methods suitable for zero pressure gradient flows. New techniques of hot-wire anemometry were developed for the sequential measurement of temperature and velocity fluctuations using a single probe and used to measure the components of the turbulent transports of momentum and energy. Turbulent Prandtl numbers were calculated from measurements within the boundary layers. It is shown that an adverse pressure gradient causes high values of turbulent Prandtl number at the wall, and suction tends to diminish it. Dissert. Abstr.

N75-19565 Stanford Univ., Calif.
THE TURBULENT BOUNDARY LAYER ON A ROUGH POROUS PLATE: EXPERIMENTAL HEAT TRANSFER WITH UNIFORM BLOWING Ph.D. Thesis
James Marvin Healzer 1974 181 p
Avail: Univ. Microfilms Order No. 74-27035

Stanton number measurements were made for a transpired turbulent boundary layer on a rough surface. Tests were conducted at uniform blowing fractions from 0 to .008, with uniform surface temperatures and uniform free-stream velocity. The x-Reynolds number range of these tests was from 10,000 to 1,000,000, and the roughness Reynolds number range from 20 to 200. Several mean velocity profiles were taken to measure boundary layer growth, and the boundary layer momentum thickness variation along the test surface was used to estimate rough plate skin friction. The data indicate the expected increase in both skin friction and heat transfer due to roughness. The blowing data indicate that a form of the Couette flow model used for smooth surface boundary layers can predict the effects of blowing on rough surface Stanton number. Predictions of the experimental boundary layers were made using a prediction method which employs the Patankar-Spalding finite-difference formulation and mean field closure with a mixing-length model with van Driest type damping. The effects of roughness were incorporated into this prediction program by modification of the mixing length and turbulent Prandtl number models used for smooth surface turbulent boundary layers. A closed-loop wind tunnel was constructed for these tests. Dissert. Abstr.

N75-19566 New Mexico State Univ., University Park.
THE EFFECT OF SURFACE MASS TRANSFER ON THE PITCHING MOTION OF A CONE IN COMPRESSIBLE FLOW Ph.D. Thesis
Bhisham Pitama Gupta 1974 192 p
Avail: Univ. Microfilms Order No. 74-27512

The effect of mass injection and suction was analyzed for the compressible, unsteady three dimensional laminar boundary layers on a cone whose angle of attack is changing with time and with nonzero pitch rate. Boundary layer equations were reduced to a series of ordinary differential equations which may readily be solved by computer. The equations for the first order correction of the velocity components and the enthalpy due to unsteadiness of the motion are uncoupled and may be solved sequentially. Solutions were obtained for the secondary flow velocity profile, the stream-wise velocity profile, chemical species concentration profile, and the total enthalpy profile with mass injection and suction rate as a parameter. The effect of the mass surface transfer is also studied on various quantities such as the skin friction coefficient (along and transverse to the streamline direction), the lift coefficient, the drag coefficient, the moment coefficients (due to the pitching, the angle of attack and the rate of change of angle of attack). Dissert. Abstr.

N75-19567 Rutgers Univ., Newark, N.J.
THE BEHAVIOR OF ISOTROPIC TEST PARAMETERS IN A SHEAR FLOW Ph.D. Thesis
Roger D. Thorpe 1974 195 p
Avail: Univ. Microfilms Order No. 74-27663

The parameters commonly used to test turbulent flows for

isotropy were compared for their sensitivity and their ability to describe the approach to local isotropy. The flow field used was the axisymmetric far wake generated by a blunt based circular cylinder axially mounted in a wind tunnel. The mean flow was characterized by a radial velocity gradient that was zero on the centerbody axis, increased to a maximum of 400 fps/in., then decreased to zero again outside the wake. The approaching mean velocity was 190 fps. An X-hot wire array was employed to measure longitudinal and azimuthal turbulence components at various radii. It was found that tests for isotropy that integrate over all turbulent scales do not describe the phenomena well. Spectral calculations describe the approach to isotopies and prone to experimental error. The strain rate analysis provided the highest sensitivity and greatest uniformity of results. Dissert. Abstr.

N75-19568 California Univ., Davis.
DENSE FLUID SHEAR VISCOSITY AND THERMAL CONDUCTIVITY VIA NONEQUILIBRIUM MOLECULAR DYNAMIKS Ph.D. Thesis
William Thomas Ashurst 1974 187 p
Avail: Univ. Microfilms Order No. 74-29287

A novel fluid transport calculation by computer simulation, via nonequilibrium molecular dynamics, of laboratory methods of transport measurement is described. Shear viscosity of soft-spheres and Lennard-Jones particles has been obtained from molecular dynamic modeling of Couette flow. Soft sphere deviations from Enskog theory are similar to those found for hard spheres by Alder, Gass, and Wainwright, using time correlations of equilibrium molecular dynamic system fluctuations. For the Lennard-Jones shear viscosity near the triple point region, there is agreement between the equilibrium result of Levesque, Verlet and Kurkijarvi and the nonequilibrium results using 108 atoms in a cube. Dissert. Abstr.

N75-19569 California Univ., Davis.
A NUMERICAL STUDY OF NATURAL CONVECTION INSIDE A HORIZONTAL CYLINDER WITH ASYMMETRIC BOUNDARY CONDITIONS Ph.D. Thesis
Robert James Kee, Jr. 1974 247 p
Avail: Univ. Microfilms Order No. 74-29319

Three numerical techniques are developed to predict the two-dimensional, transient, natural convection heat transfer within a horizontal cylinder. The techniques are explicit, ADI, and a new technique which is a hybrid between ADI and explicit. The hybrid method is found to be very much faster than the more conventional methods. All methods solve the full momentum (Navier-Stokes) and thermal energy equations in the stream function-vorticity framework. Unlike previous work, the present methods accommodate completely arbitrary temperature boundary conditions. Dissert. Abstr.

N75-19570 Colorado State Univ., Fort Collins.
TURBULENCE IN DEVELOPING BOUNDARY LAYER WITH POLYMER ADDITIVES Ph.D. Thesis
Stanley Chin-nan Shieh 1974 119 p
Avail: Univ. Microfilms Order No. 74-27962

The mean flow field and the axial turbulence of the developing boundary layer in the pipe inlet region, with and without injection of a polymer solution, were experimentally investigated. Measurements of axial turbulence were made using a hot-film anemometer with in-place calibrations. Statistical analysis of turbulence data was performed with digital computer techniques. In the presence of polymer molecules, drag reduction as much as 84 percent was achieved, and the growth of the boundary layer was markedly suppressed. Significant change of the flow characteristics was confined to a region near the wall where the radial momentum transport and the turbulence production were reduced, and the mean velocity gradient was increased. Farther into the flow region, the mean velocity profile was, in general, flatter than that for water flows. Dissert. Abstr.

N75-19571 Colorado State Univ., Fort Collins.
THREE DIMENSIONAL TURBULENT BOUNDARY LAYER FLOW ON ROUGHNESS STRIP OF FINITE WIDTH Ph.D. Thesis
Walter H. Edling 1974 261 p
Avail: Univ. Microfilms Order No. 74-27944

An experimental study results are described of a well developed, turbulent boundary layer on a smooth, flat surface encountering an area of much rougher surface. The roughened area is a strip with its length extending in the direction of the mean flow but of finite width in the surface direction normal to the flow. The resulting three-dimensional flow differs significantly from previously studied cases involving step changes in roughness of inifinte extent in the direction normal to the flow. Extensive experiments were carried out in a wind tunnel having a length of nearly 100 ft(30.5 m) with a boundary layer thickness of the order of 18-20 in. (0.5 m). Pitot tube and hot-wire anemometer measurements were made of mean velocity and Reynolds stress quantities in great detail throughout the flow field. Dissert. Abstr.

N75-19572 Notre Dame Univ., Ind.
A PHENOMENOLOGICAL THEORY OF HEAT TRANSFER IN TURBULENT SHEAR FLOWS Ph.D. Thesis
Fan-Bill Cheung 1974 148 p
Avail: Univ. Microfilms Order No. 74-26420

Based on the physics of heat transfer in turbulence, together with the use of dimensional analysis and several empirical facts, a rate equation was proposed to govern the variation of the effective turbulent thermal diffusivity. Effects of diffusion, convection, stress production, buoyant generation, and decay on n sub t are each modeled mathematically and represented by appropriate terms in the rate equation leaving only three universal constants to be determined by experiments. The formulation is intended to be general enough for turbulent shear flows with various thermal stratifications. Application was made to study a slightly heated turbulent wake behind the trailing edge of a flat plate. Solutions were carried out analytically by assuming local similarity and a far wake condition. It is shown that, under near neutral conditions, the Monin-Obukhov similarity hypothesis can be obtained as a limiting case of the present theory. Dissert. Abstr.

N75-19573 Rutgers Univ., Newark, N.J.
COUETTE INSTABILITY STRATIFIED FLUIDS Ph.D. Thesis
Eric Martin Withjack 1974 159 p
Avail: Univ. Microfilms Order No. 74-27670

The stability of Couette flow in stratified salt solutions was studied both experimentally and theoretically. Experiments were performed in a concentric cylinder apparatus with a ratio of the radius of the inner cylinder to that of the outer cylinder of 0.2. Three density gradients were considered with both the inner and outer cylinders in rotation. Flow visualization was by means of shadowgraph and dye trace methods. From shadowgraph observations, neutral stability curves were constructed at three density gradients. The spacing of the vortices and rotation periods of the instabilities were determined. A theoretical analysis was made using explicit finite difference approximations to solve the linearized disturbance equations. Small random perturbations of a given wavelength were initially distributed in the flow field, and their development in time was obtained by numerical integration. The growth or decay of the perturbation kinetic energy was monitored to determine whether the flow was unstable or stable. Dissert. Abstr.

N75-19574 Pennsylvania State Univ., University Park.
SOLUTIONS OF SOME BOUNDARY VALUE PROBLEMS IN THE THEORY OF ELASTICITY AND OF ELASTICO VISCOUS FLUIDS Ph.D. Thesis
Mohammed Latif Pasha 1974 97 p
Avail: Univ. Microfilms Order No. 74-28977

Solutions of boundary value problems concerning the presence of an annular crack in isotropic elastic medium under torsion are considered. The solution of the problem is expressed as the solution of a Fredholm integral equation of the first kind, converted into a Fredholm integral equation of the second kind, and solved by iteration. The rectilinear and rotary oscillations of an axially symmetric body in an elastico viscous fluid without any restriction on the frequency of oscillation is investigated. Rotary oscillations of prolate and oblate spheroids in an elastico viscous fluid are considered using an integral equation perturbation technique. The solution for a thin disk is obtained. Dissert. Abstr.

N75-19575# Aeronautical Research Inst. of Sweden, Stockholm.
PIPE FLOW CALIBRATION OF PRESTON TUBES OF DIFFERENT DIAMETERS AND RELATIVE LENGTHS INCLUDING RECOMMENDATIONS ON DATA PRESENTATION FOR BEST ACCURACY
Arild Bertelrud 1974 95 p refs
(FFA-125) Avail: NTIS HC $4.75

Preston tubes different diameters, and length to diameter ratios were tested in incompressible pipe flow at Reynolds number from 60,000 to 500,000. The results show differences of the same order of magnitude as the various calibration curves suggested in the literature. Different ways of expressing the data were considered, and it is concluded that the traditional parameters are not suitable. Author

N75-19576# Defence Research Establishment Ottawa (Ontario). Remote Sensing Section.
A PROCEDURE FOR MEASURING THERMAL EMISSION SPECTRA AT AMBIENT TEMPERATURE
B. G. Young and R. J. Brown Jan. 1975 59 p refs
(DREO-R-708) Avail: NTIS HC $4.25

Preliminary work to collect the infrared spectral emission signatures of ambient temperature objects is described, using a Fourier transform spectrometer operating in the 8 - 13 micrometer wavelength range. Construction of a sample container is discussed along with a description of the spectrometer, the controlling computer, and the data collection techniques and procedures. A system test, which is actually the ratio of two black bodies at different temperatures, suggests that these procedures are valid. The emissivities of Krylon 1602 ultra-flat black paint, crushed fused quartz, and three types of cotton are presented. Author

N75-19577*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A NEW FORMULATION OF THE CONSERVATION EQUATIONS OF FLUID DYNAMICS
M. Vinokur Aug. 1974 27 p refs Prepared in cooperation with Santa Clara Univ., Calif.
(NASA-TM-X-62415; A-5931) Avail: NTIS HC $3.75 CSCL 20D

The computation of time-dependent flows has inspired a new, higher-dimensional formulation of the conservation equations of fluid dynamics in which time is treated as a fourth coordinate. The formulation is derived for a constant-density flow, and then extended to a variable-density flow by introducing a fifth, fictitious coordinate. This new coordinate can also act as a source coordinate, so that external source terms can be included. The analysis is carried out for both incompressible, stratified flow, and compressible equilibrium flow. The results are then extended to non-equilibrium and magnetohydrodynamic flows. Several applications of the new formulation to the computation of time-dependent flows are discussed. Author

N75-19578*# Scientific Translation Service, Santa Barbara, Calif.
TRANSPORT OF WATER IN CATION EXCHANGE MEMBRANES. 2: INFLUENCE OF POLARIZATION LAYERS IN NATURAL CONVECTION
C. Bourdillon, M. Demarty, and E. Selegny Washington NASA Feb. 1975 33 p refs Transl. into ENGLISH from J. Chim. Phys. (Paris), v. 71, no. 6, 1974 p 819-827
(Contract NASw-2483)
(NASA-TT-F-16166) Avail: NTIS HC $3.75 CSCL 20D

The interfacial concentrations of an ion-exchange membrane polarized by electrodialysis in vertical natural convection were measured by a method using the concentration overpotential between the two sides of the membrane. Under suitable experimental conditions, profiles for which the interfacial concentrations are identical on both sides can be obtained. Under these specific conditions measurement of the water flux gives the so-called pure electroosmosis, and the water-transport number is independent of the current density. In the general case of a polarized membrane, below the limiting current density, the water transport number is found to be current-dependent. A theoretical analysis of the system using both membrane parameters and hydrodynamics in the diffusion layer was developed; it provides an interpretation of the observed phenomena as well as of previous results described in the literature. Author

N75-19579*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HEAT EXCHANGER Patent Application
D. E. Sokolowski, inventor (to NASA) Filed 19 Mar. 1975 13 p
(NASA-Case-LEW-12252-1; US-Patent-Appl-SN-559847) Avail: NTIS HC $3.25 CSCL 20M

A heat exchanger, as exemplified by a rocket combustion chamber, is constructed by stacking thin metal rings having microsized openings at selective locations to form cooling passages defined by an inner wall, an outer wall, and fins. Suitable manifolds are provided at each end of the rocket chamber. In addition to the cooling channel openings, coolant feed openings may be formed in each of the rings. The coolant feed openings may be positioned within generally U-shaped cooling channel openings. Compression on the stacked rings may be maintained by welds or the like or by bolts extending through the stacked rings. NASA

N75-19580*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A HEAT EXCHANGER AND METHOD OF MAKING Patent Application
Anthony Fortini and John M. Kazaroff, inventors (to NASA) Filed 19 Mar. 1975 14 p
(NASA-Case-LEW-12441-1; US-Patent-Appl-SN-559846) Avail: NTIS HC $3.25 CSCL 20M

A heat exchanger is described which consists of a metal shell containing a porous metal matrix, such as sinstered powdered metal, metal fibers, or metal foam. The matrix is metallically bonded or welded to the shell to eliminate high thermal resistance contact points. Cooling fluid flows from the supply, through the conduit, the pump, and the heat exchanger. They density of the porous metal matrix may be made greater to provide additional heat transfer where heat flux is high. Because the increased density will reduce the flow rate of the cooling fluid, an increased diameter may be provided to minimize or eliminate this effect. Both the density of the matrix and the diameter of the shell may be selected to provide the desired heat transfer and the cooling fluid flow rate appropriate to the heat flux variations along the shell. NASA

N75-19581*# Case Western Reserve Univ., Cleveland, Ohio.
TURBULENT FLUID FRICTION OF ROTATING DISKS
Paul Cooper Washington NASA Jul. 1973 344 p refs
(Grant NGL-36-003-139)
(NASA-CR-2274) Avail: NTIS HC $9.50 CSCL 20D

The incompressible flow field between two infinite parallel disks, one of them rotating and the other stationary, is analyzed and solved for situations where the radial Reynolds number is large enough to produce turbulent flow. An effective viscosity method is used, the effective viscosity being regarded as a scalar. The validity of the approach is demonstrated for the case of boundary layer development on a rotating disk in an infinite fluid otherwise at rest. An implicit finite-difference method is used to obtain a numerical solution of the boundary layer flow from the axis out to a radius corresponding to R sub e = 10 to the 7th power. For an assumed transition from laminar to turbulent flow at the experimentally observed value of R sub e = 300,000, the resulting skewed velocity profiles and disk friction drag agree with measurements. The case of the surrounding fluid rotating at one-half the disk speed is also solved. The resulting values of drag moment approximate experimental data for enclosed rotating disks, and the results provide insight and data for computing the flow between the parrallel disks mentioned. Applicability of the results to the disk friction drag of centrifugal pump impeller shrouds is claimed. Author

N75-19582# Royal Aircraft Establishment, Farnborough (England).
SOME RESULTS OF AN OPTICAL INVESTIGATION OF SUPERSONIC THREE-DIMENSIONAL FLOWS
V. N. Alekseev and A. L. Gonor Jan. 1975 14 p refs Transl. into ENGLISH from Mekh. Zhidkosti i Gaza (USSR), v. 1, 1974 p 179-185
(RAE-Lib-Trans-1828; BR46442) Avail: NTIS HC $3.25

A conical shadowgraph technique was extended and applied to experimental studies of three dimensional supersonic flow

fields. The flow field about lifting caret wings was investigated, and comparisons were made between experimental and theoretical values of some flow parameters. Author

N75-19583# National Aerospace Lab., Tokyo (Japan).
AN EVALUATION OF SEVERAL DIFFERENCE SCHEMES FOR COMPRESSIBLE NAVIER-STOKES EQUATIONS
Tomiko Shiguro Aug. 1974 19 p refs
(NAL-TR-385T) Avail: NTIS HC $3.25

Finite difference schemes, such as the Thommen scheme, the Allen-Cheng scheme, the explicit-implicit central difference scheme, the Scala-Gordon scheme, and the modified Saul'ev scheme, (by which one can explicitly obtain numerical solutions of the compressible Navier-Stokes equations in initial-boundary-value problems) are examined and evaluated from the viewpoint of stability, accuracy, and calculational efficiency, analytically and empirically. One- and two-dimensional shock tube flows and flows around a semi-infinite flat plate are solved. It is found that the Thommen scheme yields the best solution but is more time-consuming to use with smaller Reynolds number, and is unstable for the flow with a very strong shock wave, and the modified Saul'ev scheme is the most versatile and yields better solutions. Author

N75-19584# National Aerospace Lab., Tokyo (Japan).
NONEQUILIBRIUM NOZZLE FLOWS OF MONATOMIC AND DIATOMIC GASES
Riichi Matsuzaki and Noriaki Hirabayashi 1974 29 p refs In JAPANESE; ENGLISH summary
(NAL-TR-397) Avail: NTIS HC $3.75

Chemically nonequilibrium, quasi-one-dimensional flows of partially ionized, monatomic and diatomic gases through a convergent-divergent nozzle were studied theoretically. In the flow of monatomic gas, ionization-recombination nonequilibrium flow of argon is considered; the degree of ionization, electron number density, pressure, density, species temperature, and velocity are calculated through the nozzle. Each species is assumed to have different temperature from other. The electron temperature is in excess of the ion and atom temperatures, and the ion temperature is in slight excess of the atom temperature far downstream. In the flow of diatomic gas, ionization-recombination, dissociation-recombination, and vibrational nonequilibrium flow of nitrogen is considered. The effects of charge transfer and dissociative recombination reactions are also taken into account. An electron energy equation is solved together with species rate equations and macroscopic conservation equations. Species number densities, pressure, density, electron temperature, temperatures of heavy particles, vibrational energy of N2, Mach numbers, and velocity are calculated through the nozzle. Properties in dissociation-recombination equilibrium flow and perfect (frozen) flow of nitrogen are also calculated and some of them are compared with the nonequilibrium flow properties. Author

N75-19585# Advisory Group for Aerospace Research and Development, Paris (France).
TECHNICAL EVALUATION REPORT ON FLUID DYNAMICS PANEL SYMPOSIUM ON V/STOL AERODYNAMICS
B. M. Spee (Natl. Aerospace Lab.) Feb. 1975 13 p refs Symp. held at Delft, Netherlands, 24-26 Apr. 1974
(AGARD-AR-78) Avail: NTIS HC $3.25

Papers presented at the Fluid Dynamics Panel Symposium are reviewed along with the current situation in V/STOL aerodynamics research. The following areas were discussed: powered high-lift systems; mechanical high-lift systems and jet lift. It is concluded that the direct operating cost of V/STOL must be decreased through optimization of aerodynamic characteristics in order to compete with conventional aircraft. Author

N75-19586*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
ANALYTICAL COMPARISON OF HYPERSONIC FLIGHT AND WIND TUNNEL VISCOUS/INVISCID FLOW FIELDS Final Report
H. J. Fivel, R. V. Masek, and L. J. Mockapetris Washington NASA Feb. 1975 124 p refs
(Contract NAS1-11728)
(NASA-CR-2489) Avail: NTIS HC $5.25 CSCL 20D

Flow fields were computed about blunted, 0.524 and 0.698 radians, cone configurations to assess the effects of nonequilibrium chemistry on the flow field geometry, boundary layer edge conditions, boundary layer profiles, and heat transfer and skin friction. Analyses were conducted at typical space shuttle entry conditions for both laminar and turbulent boundary layer flow. In these calculations, a wall temperature of 1365 K (2000 F) was assumed. The viscous computer program used in this investigation was a modification of the Blottner non-similar viscous code which incorporated a turbulent eddy viscosity model after Cebeci. The results were compared with equivalent calculations for similar (scaled) configurations at typical wind tunnel conditions. Wind tunnel test gases included air, nitrogen, CF4 and helium. The viscous computer program used for wind tunnel conditions was the Cebeci turbulent non-similar computer code. Author

N75-19587# National Aerospace Lab., Tokyo (Japan).
NONEQUILIBRIUM NOZZLE FLOWS OF MONATOMIC AND DIATOMIC GASES
Riichi Matsuzaki and Noriaki Hirabayashi Dec. 1974 29 p refs In JAPANESE; ENGLISH summary
(NAL-TR-397) Avail: NTIS HC $3.75

Chemically nonequilibrium, quasi-one-dimensional flows of partially ionized, monatomic and diatomic gases through a convergent-divergent nozzle were studied theoretically. The plenum chamber, with which a nozzle of prescribed shape is connected, is assumed to be in chemical equilibrium. In the flow of monatomic gas, ionization-recombination nonequilibrium flow of argon is considered; the degree of ionization, electron number density, pressure, density, species temperature, and velocity are calculated through the nozzle. The electron temperature is found to be in excess of the ion and atom temperatures. In the flow of diatomic gas, ionization-recombination, dissociation-recombination, and vibrational nonequilibrium flow of nitrogen is considered. The effects of charge transfer and dissociative recombination reactions are taken into account. An electron energy equation which includes collision terms is solved together with species rate equations and macroscopic conservation equations. Species number densities, pressure, density, electron temperature, temperatures of heavy particles, vibrational energy of N2, Mach numbers, and velocity are calculated through the nozzle. Properties in dissociation-recombination equilibrium flow and perfect (frozen) flow of nitrogen are calculated and compared with the nonequilibrium flow properties. Author

N75-19588# Danish Research Center for Applied Electronics, Hoersholm.
HEAT SINKS: A STUDY OF VARIABLE TYPES OF HEAT SINKS. EFFECTS OF VARIOUS FACTORS ON TEMPERATURE PROFILES [KOLEPROFILER: EN UNDERSOGELSE AF FORSKELLIGT UDFORMEDE KOLEPROFILER. FORSKELLIGE FAKTORERS INDFLYDELSE PA PROFILETS VIRKNING]
U. Fabricius Oct. 1974 70 p refs In DANISH; ENGLISH summary
(ECR-45) Avail: NTIS HC $4.25

Measurements were carried out to determine the temperature gradients and temperature distribution of the heat sinks. Theoretical investigations show that convection of the heat sink is strongly dependent on the space between fins. Computer calculations of the thermal resistance and temperature gradient of the heat sinks were accomplished; these were to find which proportion (between the height of the profile and height of the fin) gives the lowest thermal resistance. The amount of power that can be added to the heat sink at intermittent service without influencing the junction temperature of the power component was determined. Author

N75-19589*# McDonnell-Douglas Corp., Long Beach, Calif.
A THEORETICAL METHOD FOR THE ANALYSIS AND DESIGN OF AXISYMMETRIC BODIES Final Report
T. D. Beatty Washington NASA Mar. 1975 279 p refs
(Contract NAS1-12986)
(NASA-CR-2498) Avail: NTIS HC $8.75 CSCL 20D

A theoretical method is presented for the computation of the flow field about an axisymmetric body operating in a viscous, incompressible fluid. A potential flow method was used to determine the inviscid flow field and to yield the boundary

conditions for the boundary layer solutions. Boundary layer effects in the forces of displacement thickness and empirically modeled separation streamlines are accounted for in subsequent potential flow solutions. This procedure is repeated until the solutions converge. An empirical method was used to determine base drag allowing configuration drag to be computed. Author

N75-19590*# Tuskegee Inst., Ala. School of Mechanical Engineering.
STEADY-STATE AND TRANSIENT OPERATION OF A HEAT-PIPE RADIATOR SYSTEM Technical Report, Jan. - Aug. 1974
John P. Sellers Dec. 1974 93 p refs
(Contract NAS9-13844)
(NASA-CR-141719; HP-1) Avail: NTIS HC $4.75 CSCL 20M

Data obtained on a VCHP heat-pipe radiator system tested in a vacuum environment were studied. Analyses and interpretation of the steady-state results are presented along with an initial analysis of some of the transient data. Particular emphasis was placed on quantitative comparisons of the experimental data with computer model simulations. The results of the study provide a better understanding of the system but do not provide a complete explanation for the observed low VCHP performance and the relatively flat radiator panel temperature distribution. The results of the study also suggest hardware, software, and testing improvements. Author

N75-19591*# Lockheed Missiles and Space Co., Huntsville, Ala. Huntsville Research and Engineering Center.
USER'S GUIDE AND DESCRIPTION OF THE STREAMLINE DIVERGENCE COMPUTER PROGRAM
P. R. Sulyma and J. V. McAnally Jan. 1975 45 p refs
(Contract NAS9-13429)
(NASA-CR-141717; LMSC-HREC-TM-D390450) Avail: NTIS HC $3.75 CSCL 20D

The streamline divergence program was developed to demonstrate the capability to trace inviscid surface streamlines and to calculate outflow-corrected laminar and turbulent convective heating rates on surfaces subjected to exhaust plume impingement. The analytical techniques used in formulating this program are discussed. A brief description of the streamline divergence program is given along with a user's guide. The program input and output for a sample case are also presented. Author

N75-19592# Royal Aircraft Establishment, Farnborough (England).
DISPLACEMENT THICKNESS IN HIGH-ORDER BOUNDARY LAYERS
K. Gersten Jan. 1975 19 p refs Transl. into ENGLISH from ZAMM (West Ger.), v. 54, 1974 p 165-171
(RAE-Lib-Trans-1821; BR46702) Avail: NTIS HC $3.25

Lighthill's four definitions of displacement thickness were extended to higher-order boundary layers for incompressible two-dimensional and axisymmetric flow. Three of the definitions are equivalent, but they only yield the same result as the fourth in incompressible flow past impermeable bodies. The first two terms of the asymptotic expansion of the displacement thickness for large Reynolds number were determined. Author

N75-19593# Aktiebolaget Atomenergi, Studsvik (Sweden).
EFFECT OF WALL FRICTION AND VORTEX GENERATION ON RADIAL VOID DISTRIBUTION: THE WALL-VORTEX EFFECT
Z. Rouhani 1974 34 p
(AE-497) Avail: ERDA Depository Libraries HC $4.75

Arguments are presented to prove the existence of rolling vortices in two-phase flow. In the liquid phase they will appear in a boundary layer near the walls while in the continuous vapor phase they will occur near the interface with a liquid film. The intensity and size of these vortices are expected to depend on the local velocity gradients normal to the walls. A discussion is given of the interaction between the rotational field associated with such vortices and bubbles in liquid flow or droplets in vapor flow. This interaction is called the wall-vortex effect. It appears that several, apparently unrelated, phenomena observed in two-phase flow systems may be interpreted in terms of this mechanism. Author (NSA)

N75-19594# Academia R. P. R., Bucharest.
NON-LINEARITIES IN HEAT TRANSFER IN BOUNDARY LAYERS
C. Popescu, S. Boeriv, L. Biro, and I. Turcu 1974 20 p refs In ROMANIAN
(IFA-FR-119-1974) Avail: AEC Depository Libraries HC $4.00

A qualitative study is made of the local values of thermal flux in cases of nonlinear heat transfer in boundary layers. Transfer equations are solved by numerical methods for the case of very large Prandtl numbers and for the case of very small Prandtl numbers. Author (NSA)

N75-19595# United Kingdom Atomic Energy Authority, Harwell (England).
DEVELOPMENT OF A MODEL FOR HORIZONTAL ANNULAR FLOW
P. Hutchinson, D. Butterworth, and R. G. Owen Sep. 1974 19 p refs
(AERE-R-7789) Avail: ERDA Depository Libraries HC $3.25

Work is proceeding on the development of a model for horizontal, annular, two-phase flow. The model involves the following: an analysis of the droplet diffusion in the gas phase that allows for the variation of droplet entrainment around the tube perimeter but does not allow for gravity forces on the drops; drainage in the film due to gravity and allowance is made for turbulence in the film but not for the effects of waves; the entrainment correlation developed at Harwell; a prediction of gas phase hydrodynamics and axial shear stress on the film by a technique that allows for the different roughnesses around the tube due to waves; and an empirical relationship between film thickness and effective roughness. Combining these models with a film mass continuity equation permits prediction of the full flow hydrodynamics. Author (NSA)

N75-19596# Kozponti Fizikai Kutato Intezet, Budapest (Hungary).
VARIABLE GAS-FLOW COOLING SYSTEM FOR TEMPERATURES BETWEEN 4.2 AND 400 K
J. Balla Sep. 1974 14 p refs
(KFKI-74-66) Avail: ERDA Depository Libraries HC $4.00

Different types of gas-flow temperature control devices are briefly reviewed. NSA

N75-19597# Battelle-Northwest, Richland, Wash. Pacific Northwest Labs.
HETRAN: A SUBPROGRAM PACKAGE FOR PREDICTING THE HEAT TRANSFER ACROSS THE SURFACE OF A NATURAL BODY OF WATER
D. G. Daniels and C. A. Oster Jun. 1974 62 p refs
(Contract AT(45-1)-1830)
(BNWL-B-361) Avail: NTIS HC $4.25

A computer subprogram HETRAN was developed for prediction of atmospheric heat exchange across the air-water interface of a natural water body. The program uses standard meteorologic data and analytic-empirical relationships to calculate the component energy fluxes. Included in the general heat budget are net shortwave radiation, net atmospheric radiation, back radiation, evaporative heat loss, and convective loss or gain at the air-water interface. The program is capable of predicting diurnal patterns and long term temperature variations. The subprograms are designed so that they may be easily coupled to generalized programs for far-field temperature predictions. Author (NSA)

N75-19598# Sandia Labs., Albuquerque, N.Mex.
GAS-TRANSFER ANALYSIS. SECTION A: INTRODUCTION TO GAS TRANSFER FUNDAMENTALS
D. R. Chenoweth Sep. 1974 30 p refs
(Contract AT(29-1)-789)
(SAND-74-8211) Avail: NTIS HC $3.75

The definition of various types of gas-transfer problems is examined and some of the physical phenomena affecting them are discussed. The governing dimensionless parameters and their use as well as the common terminology and assumptions used in analysis are also discussed. It is shown, using an equilibrium-state analysis, that the maximum possible importance of reservoir heat transfer at pressure equilibrium can be determined prior to solving a transient gas-transfer problem. Author (NSA)

N75-19599# General Electric Co., Philadelphia, Pa.
EVALUATION OF A FOSSIL FUEL FIRED CERAMIC REGENERATIVE HEAT EXCHANGER Interim Report, Oct. 1973 - Aug. 1974
Charles S. Cook Oct. 1974 62 p refs
(Contract DI-14-32-0001-1533)
(PB-236346/3; OCR-92-INT-1) Avail: NTIS HC $4.25 CSCL 10B

A ceramic regenerative heat exchanger with an alumina cored brick matrix was designed and installed for the purpose of determining molecular gas and particulate contaminant levels in the output argon flow. The heat exchanger is viewed as a laboratory scale prototype high temperature heat source for closed cycle energy conversion systems operating with noble gas working fluids with an emphasis on closed cycle MHD application. The heat exchanger has a 29in. inside shell diameter with a 14in. diameter active flow matrix and has design operating conditions of argon flow at 5.45 lbm-sec, 2900F to 3000F and 10 atmospheres stagnation pressure. The blowdown test time is 60 seconds. GRA

N75-19600# Pennsylvania State Univ., University Park. Applied Research Lab.
TIME-DEPENDENT THRUST GENERATED BY A PROPELLER OPERATING IN A TURBULENT INFLOW
D. E. Thompson 26 Apr. 1974 24 p refs
(Contract N00017-73-C-1418)
(AD-A001337; TM-74-99) Avail: NTIS CSCL 20/4

The broadband radiated sound of a propulsor can be related to the time-dependent thrust generated by the propulsor due to operation in a randomly varying turbulent velocity field. In order to understand better the radiated sound phenomenon, an experimental and theoretical investigation of the time-dependent thrust response of a propeller due to operation in turbulent inflows having various characteristic parameters was conducted. The experimental investigations employ an unsteady thrust balance mounted in the drive shaft of a 5-bladed free-stream propeller. Measurements of the time-dependent thrust generated by the propeller were made for turbulent inflows having a range of characteristics length scales and a range of turbulent intensity. GRA

N75-19601# Army Foreign Science and Technology Center, Charlottesville, Va.
SOME APPROXIMATE METHODS FOR THE STUDY OF NONLINEAR OSCILLATIONS OF A LIQUID IN VESSELS OF COMPLEX GEOMETRICAL FORM
I. A. Lukovskii 20 Jan. 1974 13 p refs Transl. into ENGLISH from Proceedings of Conf. on Primenenie Teorii Nelineinykh Kolebanii v Nelineinym Kolebaniyam (Kiev), 25 Aug. - 4 Sep. 1969 p 430-438
(AD-A001487; FSTC-HT-23-1647-73) Avail: NTIS CSCL 20/4

The problem of nonlinear oscillations of a liquid in a moving vessel of complicated geometric form is considered. An approximate method for the solution of the nonlinear boundary value problems is suggested which is based on representing the perturbed free surface in a form that essentially takes advantage of the geometric characteristics of the cavity. The nonlinear boundary-value problem is reduced to solving weighted linear eigenvalue problems with boundary conditions involving a parameter. Approximate methods for solving these eigenvalue problems are proposed. GRA

N75-19602# Army Foreign Science and Technology Center, Charlottesville, Va.
ANALYSIS OF FLUIDIC ELEMENT INPUT CHARACTERISTICS
L. A. Zalmanzon 1 Apr. 1974 12 p refs Transl. into ENGLISH from proceedings of 4th Intern. Fluidics Conf. (Varna), 14-18 Oct. 1972 8 p
(AD-A001486; FSTC-HT-23-1637-73; Paper-A-2) Avail: NTIS CSCL 13/7

Data from tests made of restrictor and jet elements are analyzed. A procedure for calculating systems containing these elements is described. GRA

N75-19603# Naval Ship Research and Development Center, Bethesda, Md.
INDUCED FIELD-POINT PRESSURES OF A DUCTED PROPELLER SYSTEM Final Report
John J. Nelka Oct. 1974 44 p refs
(SF43432)
(AD-A002453; NSRDC-4270) Avail: NTIS CSCL 20/4

Total fluctuating pressures were measured on the internal surface of a 0-degree angle-of-attack duct of a ducted propeller system (Kort nozzle type). The effects of blade loading in uniform flow and propeller blade cavitation in nonuniform flow on the harmonics of the blade-frequency propeller-induced pressure were determined. Also determined were the blade-frequency pressure-induced duct forces. Experimental results indicate that the blade-frequency pressures increase for an increase in blade loading with the second and third blade-frequency pressure being significant with respect to the blade-frequency pressure. Fluctuating blade-frequency vertical forces determined by integrating the pressure results from nonuniform inflow noncavitating conditions were approximately 1-percent of the mean thrust. In the experiments conducted at a given loading, cavitation on the propeller blades tended to increase the blade-frequency pressure downstream of the propeller by as much as a factor of three. GRA

N75-19604# Naval Postgraduate School, Monterey, Calif.
A LIQUID CRYSTAL THERMOGRAPHIC STUDY OF A HEATED CYLINDER IN CROSS FLOW Annual Report, 1 Jan. - 31 Oct. 1974
Thomas E. Cooper, Richard J. Field, and John F. Meyer Nov. 1974 56 p refs
(RR0000110)
(AD-A002458; NPS-59CG74111) Avail: NTIS CSCL 20/4

A thermographic technique is presented that allows visual determination of both qualitative and quantitative heat transfer and fluid flow information to be obtained on heated objects placed in forced convection environments. The technique employs cholesteric liquid crystals as the temperature sensing agent. The liquid crystals indicate temperature by exhibiting brilliant changes in color over discrete, reproducible temperature ranges. The technique has been used to quickly and easily obtain information on the variation of the Nusselt number on a right circular cylinder placed in a crossflow of air. In addition to yielding precise quantitative heat transfer information the liquid crystal thermographic technique afforded the opportunity to visually observe the effects of flow separation, the separation bubble region, the turbulent boundary layer, and the turbulent wake on the surface temperature of the heated cylinder. GRA

N75-19605# Naval Ship Research and Development Center, Bethesda, Md.
FOIL-MOUNTED BODY CAVITATION CHARACTERISTICS FOR HYDROFOIL SHIP Final Report
Douglas E. Layne Nov. 1974 32 p refs
(AD-A001691; NSRDC-4392) Avail: NTIS CSCL 13/10

Cavitation inception conditions were determined for a proposed body to be mounted below the foil of the PCH-1 (HIGH POINT) hydrofoil craft. The cavitation characteristics of an 1/8-scale model were determined experimentally and projected to full scale. It is predicted that the full-scale body will cavitate at speeds of 47 knots and above. Several pylon designs were investigated. The best pylon design should cavitate at 36 knots and above when unyawed and unpitched, and at much lower speeds with yaw and pitch displacements. GRA

N75-19606# Naval Research Lab., Washington, D.C.
ON MODELING VORTEX-EXCITED OSCILLATIONS Interim Report
Richard A. Skop Nov. 1974 21 p refs
(NRL Proj. 84F02-36; YF53535004)
(AD-A001702; NRL-MR-2927) Avail: NTIS CSCL 20/4

A mathematical model for describing vortex-excited oscillations of bluff cylinders is developed. The empirical parameters in the model are related to the physical parameters of the fluid-structural system for various values of the vortex-induced oscillating lift force. Model predictions are compared with experimental results and excellent agreement is obtained. GRA

N75-19607# Genoa Univ. (Italy). Inst. di Fisica Tecnica e Impianti Termotecnici.
ON THE INFLUENCE OF THE THICKNESS AND THERMAL PROPERTIES OF HEATING WALLS ON THE HEAT TRANSFER COEFFICIENT IN NUCLEATE BOILING Final Report
Giovanni Guglielmini, Ugo Magrini, and Enrico Nannei May 1974 32 p refs
(Contract DAJA37-73-C-2743; DA Proj. 2A2-61102-B-33H)
(AD-A002073) Avail: NTIS CSCL 20/13

An experimental investigation was conducted on saturated pool boiling of water at atmospheric pressure using thin walled electrically heated cylinders made of various metals, and suspended horizontally. These cylinders were made by plating copper, silver, zinc, nickel and tin on non-metallic rods. The wall thickness ranged from 5.0 to 250 micrometers. The experiments have shown that the heat transfer coefficient is strongly dependent upon the wall thickness of the cylinder. Results indicated that if the thermal conductivity of the metal is small, the higher the influence of the wall thickness is. However, no appreciable effect was observed for metals having a higher conductivity, such as copper or silver. GRA

N75-19608# Naval Civil Engineering Lab., Port Hueneme, Calif.
HEAT TRANSFER DESIGN AND PROOF TESTS OF A RADIOISOTOPE THERMOELECTRIC GENERATOR Final Report, Nov. 1972 - Jul. 1974
Earl J. Beck Nov. 1974 51 p
(AD-A002218; CEL-TN-1359) Avail: NTIS CSCL 18/14

The object was to design, build, and test the heat rejection portions of a large 2-kw(e) radioisotope thermoelectric generator (RTG). The design was optimized to produce the lowest practicable temperatures at the cold junction of a large number of thermoelectric heat-to-electricity conversion elements. The geometry was largely defined by the size, shape, and required number of thermoelectric elements and by their deployment at the upper end of a large pressure-resistant hull. The work showed the capability of the 12-finned convectors to maintain a temperature below 90F, at the inner face of the convectors both when the unit was vertical and when tilted 60 degrees from the vertical. The solid copper showed no signs of corrosion; the potential corrosion problem is discussed in some detail in the report, as are related problems of flow, protection, and possible fouling from marine growth. GRA

N75-19609# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
WAVE MECHANICS OF BOUNDARY LAYER TURBULENCE AND NOISE
Marten T. Landahl 1974 29 p refs Presented at the Ann. Meeting of the Acoustical Soc. of Am., 85th, 13-15 Apr. 1973 Prepared in cooperation with Royal Inst. of Tech., Stockholm, Sweden
(AF Proj. 9781)
(AD-A001932; AFOSR-74-1753TR) Avail: NTIS CSCL 20/4

Recent advances in the understanding of the structure of boundary layer turbulence form the basis of a new conceptual model for the fluctuating velocity field. In this, an active mode of small-scale motion is coupled to a large-scale passive mode by aid of wave mechanical considerations. The small-scale motion originates during the intermittent bursting in the wall layer leading to excitation of large-scale, damped, traveling shear waves. It is argued that the passive wave-like mode gives the major contribution to the pseudosound, whereas the active bursting mode serves as the predominant source for the radiative noise. It is shown that the bursting mode gives rise to compact noise sources of both dipole and quadrupole type whose strengths are related to the turbulent shear stress production. GRA

N75-19610# McDonnell Aircraft Co., St. Louis, Mo.
HEAT TRANSFER DUE TO SHOCK WAVE TURBULENT BOUNDARY LAYER INTERACTIONS ON HIGH SPEED WEAPON SYSTEMS Final Report, Jan. 1973 - Apr. 1974
K. H. Token Apr. 1974 117 p refs
(Contract F33615-73-C-3046; AF Proj. 1366)
(AD-A002685; AFFDL-TR-74-77) Avail: NTIS CSCL 20/4

Three-dimensional shock wave turbulent boundary layer interactions caused by a fin-plate configuration were investigated experimentally and analytically. Wind tunnel tests were conducted at a Mach number of 3.71 and the interactions were studied at near full scale conditions by mounting one of several fins normal to the tunnel sidewall in the naturally turbulent, 6 inches thick sidewall boundary layer. Tests were conducted primarily with a sharp leading edge planar fin, although blunt and blunt swept planar fins were also used. The experimental data were used to develop new analytical and correlation procedures. GRA

N75-19300 Polytechnical Univ. of Madrid (Spain). Lab. of Aerodynamics.
SOME PHYSICAL AND CHEMICAL PROCESSES IN FLUIDS
I. DaRiva *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 171-183 refs (For availability see N75-19285 11-12)

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N75-19611* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AUTOMATIC LIQUID INVENTORY COLLECTING AND DISPENSING UNIT Patent
John B. Hall, Jr. and Edwin F. Williams, inventors (to NASA) Issued 4 Feb. 1975 6 p Filed 21 Feb. 1973 Supersedes N73-18474 (11 - 09, p 1039)
(NASA-Case-LAR-11071-1; US-Patent-3,864,060; US-Patent-Appl-SN-334349; US-Patent-Class-417-36; US-Patent-Class-73-221; US-Patent-Class-417-138; US-Patent-Class-417-395) Avail: US Patent Office CSCL 14B

A means is provided for automatically collecting waste liquids and for simultaneously feeding these liquids into water recovery processes. The invention includes first and second tanks with first and second two-way solenoid valves associated with each of the tanks. The first solenoid valve is connected to the liquid source and its associated tank so as to allow liquid to flow into the tank when the valve is in its normal position and to allow the liquid to flow out of the tank when the valve is in its actuated position. The second valve is connected to its associated tank and a gas supply so as to allow gas inside the tank to flow out when the valve is in its normal position and to allow gas to flow from the gas supply into the tank when the valve is in its actuated position. Control circuits are included for actuating the two valves associated with the first tank and not actuating the valves associated with the second tank. The first tank is filled and the second tank is emptied.
Official Gazette of the U.S. Patent Office

N75-19612* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
VACUUM LEAK DETECTOR Patent
George P. Kazokas, inventor (to NASA) (McDonnell-Douglas Corp., Huntington Beach, Calif.) Issued 11 Feb. 1975 5 p Filed 2 Oct. 1973 Supersedes N73-32344 (11 - 23, p 2793) Sponsored by NASA
(NASA-Case-LAR-11237-1; US-Patent-3,864,960; US-Patent-Appl-SN-402868; US-Patent-Class-73-46; US-Patent-Class-73-49.2; US-Patent-Class-340-242) Avail: US Patent Office CSCL 14B

A leak detector for use with high vacuum seals as used in feedthroughs and hatch covers for manned spacecraft and vacuum systems is described. Two thermistors are used, one exposed directly to vacuum and the other exposed to a secondary chamber formed by the seal being monitored and a second auxiliary seal. Leakage into the secondary chamber causes an unbalance of an electrical bridge circuit in which the thermistors are connected.
Official Gazette of the U.S. Patent Office

N75-19613* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SPECTROMETER INTEGRATED WITH A FACSIMILE CAMERA Patent
Ernest E. Burcher, Daniel J. Jobson, Stephen J. Katzberg, and William L. Kelly, IV, inventors (to NASA) Issued 4 Mar. 1975 5 p Filed 2 Aug. 1973 Supersedes N73-28496 (11 - 19, p 2300)
(NASA-Case-LAR-11207-1; US-Patent-3,869,212; US-Patent-Appl-SN-385013; US-Patent-Class-356-189; US-Patent-Class-178-DIG.20; US-Patent-Class-250-332; US-Patent-Class-356-96; US-Patent-Class-356-186; US-Patent-Class-356-83) Avail: US Patent Office CSCL 14B

This invention integrates a spectrometer capability with the basic imagery function of facsimile cameras without significantly increasing mechanical or optical complexity, or interfering with the imaging function. The invention consists of a group of photodetectors arranged in a linear array in the focal plane of the facsimile camera with a separate narrow band interference filter centered over each photodetector. The interference filter photodetector array is on a line in the focal plane of the facsimile camera along the direction of image motion due to the rotation of the facsimile camera's vertical mirror. As the image of the picture element of interest travels down the interference filter photodetector array, the photodetector outputs are synchronously selected and sampled to provide spectral information on the single picture element.

Official Gazzette of the U.S. Patent Office

N75-19614* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
INSTRUMENTATION FOR MEASUREMENT OF AIRCRAFT NOISE AND SONIC BOOM Patent
Allan J. Zuckerwar, inventor (to NASA) (Youngstown State Univ.) Issued 4 Mar. 1975 7 p Filed 25 Apr. 1973 Supersedes N73-22387 (11 - 13, p 1529) Sponsored by NASA
(NASA-Case-LAR-11173-1; US-Patent-3,868,856; US-Patent-Appl-SN-354408; US-Patent-Class-73-557; US-Patent-Class-332-2) Avail: US Patent Office CSCL 14B

A jet aircraft noise and sonic boom measuring device which converts sound pressure into electric current is described. An electric current proportional to the sound pressure level at a condenser microphone is produced and transmitted over a cable, amplified by a zero drive amplifier and recorded on magnetic tape. The converter is comprised of a local oscillator, a dual-gate field-effect transistor (FET) mixer and a voltage regulator/impedance translator. A carrier voltage that is applied to one of the gates of the FET mixer is generated by the local oscillator. The microphone signal is mixed with the carrier to produce an electrical current at the frequency of vibration of the microphone diaphragm by the FET mixer. The voltage of the local oscillator and mixer stages is regulated, the carrier at the output is eliminated, and a low output impedance at the cable terminals is provided by the voltage regulator/impedance translator.

Official Gazette of the U.S. Patent Office

N75-19615* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
METER FOR USE IN DETECTING TENSION IN STRAPS HAVING PREDETERMINED ELASTIC CHARACTERISTICS Patent
George V. Buhler (McDonnell-Douglas Corp., Huntington Beach, Calif.) and Dale E. Havens, inventors (to NASA) (McDonnell-Douglas Corp., Huntington Beach, Calif.) Issued 11 Feb. 1975 5 p Filed 11 Oct. 1973 Supersedes N74-10421 (12 - 01, p 0053) Sponsored by NASA
(NASA-Case-MFS-22189-1; US-Patent-3,864,953; US-Patent-APPL-SN-405342; US-Patent-Class-73-143; US-Patent-Class-33-148D) Avail: US Patent Office CSCL 14B

A meter for detecting tension in elastic bodies, especially in fabric straps employed as tie down straps for stowed objects is presented. The meter is characterized by a pair of elongated arms coupled together for pivotal motion about a common axis in a common plane and a strap receiver located at adjacent ends of the arms for receiving and securing adjacent portions of the strap. The receivers are supported by the arms for motion along intersecting arcs, and motion detection means is located at the opposite ends of the arms for detecting the magnitude of the motion imparted to the receivers as the strap is placed in tension.

Official Gazette of the U.S. Patent Office

N75-19616* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MULTIPLATE FOCUSING COLLIMATOR Patent
Richard B. Hoover and James H. Underwood, inventors (to NASA) Issued 4 Mar. 1975 5 p Filed 28 Jun. 1973 Supersedes N73-27380 (11 - 18, p 2150)
(NASA-Case-MFS-20932-1; US-Patent-3,869,615; US-Patent-Appl-SN-374441; US-Patent-Class-250-508; US-Patent-Class-250-510; US-Patent-Class-250-505) Avail: US Patent Office CSCL 14B

An appartus is described for scanning relatively small near sources of penetrating radiation to obtain the energy distribution thereof, wherein a collimator assembly is interposed between a radiation source and a radiation detector. The collimator assembly has a plurality of plates aligned in parallel planes with respect to a common axis normal to their centers. All the plates have similar random distribution of apertures. All apertures on each plate are the same size. The size of respective plates, the size of the apertures of said respective plates, and the spacing between said respective plates vary precisely according to a predetermined ratio to produce radiation channels which converge to a focal point. The radiation incident to the radiation detector is maximized when the focal point and the radiation source are co-incident.

Official Gazette of the U.S. Patent Office

N75-19617 Polish Academy of Sciences, Warsaw.
ACTUAL PROBLEMS OF PHOTOMETRY [AKTUALNE PROBLEMY FOTOMETRII]
Stanislaw Kosek 1974 22 p refs In POLISH
(Rept-43/1974) Avail: Issuing Activity

Basic photometric quantities, visible light radiation, and photometric constants were investigated along with luminous intensity. Other topics discussed include monochromators, radiometric measurements, Planck's constants, absorption coefficients, transport equations, spectrophotometry, and infrared radiation.

Transl. by M.J.S.

N75-19618 Tennessee Univ., Knoxville.
DESIGN CONSIDERATIONS FOR PARTICULATE INSTRUMENTATION EMPLOYING LASER LIGHT SCATTERING Ph.D. Thesis
Thomas Barry Carlson 1974 131 p
Avail: Univ. Microfilms Order No. 74-27193

The design and development of a light scattering instrument that performs in situ and online particle density distribution measurements of polydisperse aerosols is investigated. It was found that off-axis systems are optimally designed for detection of drift particles in a fluctuating ensemble of background particles and that in-line systems operating near the forward lobe collect more radiation with a correspondingly smaller minimum detectable particle. Prototype systems were constructed and measured response characteristics showed good agreement with the Mic theory. Problems encountered with the large, external scattering volume were evident in the form of non-ideal response functions because of inhomogeneities in the spatial intensity distribution of the laser source and variable collection of scattered light. These difficulties were solved by introduction of a light integrating optical system and by proper design of receiver optics to minimize collection or solid angle effects. It was shown that typical particle size distributions can be recovered by appropriate mathematical techniques, even for instruments exhibiting non-ideal response characteristics.

Dissert. Abstr.

N75-19619+ Societe Coderg, Clichy (France). Dept. Interferometrie.
MICHELSON INTERFEROMETER AND REAL TIME COMPUTATION SYSTEM FOR NEAR INFRARED SPECTROSCOPY Final Report [INTERFEROMETRE DE MICHELSON ET SYSTEME DE CALCUL EN TEMPS REEL POUR SPECTROSCOPIE DANS LE PROCHE INFRA-ROUGE COMPTE RENDU DE FIN DE CONTRAT]
31 Mar. 1972 19 p In FRENCH
(Contract DGRST-71-7-2-673)
Avail: NTIS HC $3.25

A prototype of a near IR Michelson interferometer was investigated. Solutions for the construction and optimization of certain parts of the interferometer are discussed. The prototype allows the optimization of a device for high precision displacement. Preliminary tests of the achromatism of a separator-compensator setup in the spectral interval which KBr layers let through were carried out. The objective was the realization of a device with reduced dimensions enabling the investigation of solids, liquids and gas at all temperatures. Spectrum computation takes place in real time, and an optimal resolution of 0.1/cm is achieved. ESRO

N75-19620 + Compagnie Electro-Mecanique, Le Blanc-Mesnil (France). Lab. d'Optique Coherente.
LOCALIZATION AND MEASUREMENT OF HEAVY ELECTROMECHANICAL EQUIPMENT VIBRATION AMPLITUDE Final Report [LOCALISATION ET MESURE DE L'AMPLITUDE DES VIBRATIONS DU GROS MATERIEL ELECTROMECANIQUE]
Bernard Peroz and Alain Thomas Nov. 1973 47 p refs In FRENCH
(Contract DGRST-72-7-0662-00)
Avail: NTIS HC $3.75

A method is presented for the visualization and calibration of vibration amplitudes from a given object using speckles. The detectors used are photographic films. The linearity and spectral response of various films were studied and the most suitable one determined. The vibration visualization qualitative method of Mottier was extended into a quantitative calibration. An automatic stroboscopic method was used to separate the proper vibration modes of a real object, but the light flux available then decreases to the extent that electro-optical detectors are required. A test was performed with a luminance amplifier to assess the feasibility of the method in real operating conditions. ESRO

N75-19621 *# National Aeronautics and Space Administration, Washington, D.C.
RESISTIVE ANODE IMAGE CONVERTER Patent Application
Michael L. Lampton (Calif. Univ., Berkeley) and Francesco Paresce, inventors (to NASA) (Calif. Univ., Berkeley) Filed 3 Mar. 1975 14 p Sponsored by NASA
(NASA-Case-HQN-10876-1; US-Patent-Appl-SN-555336) Avail: NTIS HC $3.25 CSCL 14E

An apparatus is disclosed for imaging soft X-ray and ultraviolet electromagnetic radiation and charged particles. The apparatus includes a pair of microchannel electron multiplier plates that are connected in a cascaded chevron configuration which intercepts an incident beam of radiation or charged particles which are being imaged. Incident photons or charged particles strike the front surface of the chevron configuration causing emission of electrons. The electrons are accelerated by a voltage gradient and strike the inner side walls of the individual channels which comprise the microchannel electron multiplier plates causing emission of secondary electrons. Accelerated and multiplied secondary electrons impinge upon a resistive anode after they transverse the chevron configuration. A pulse position circuit converts the magnitude or transit time of the currents flowing from the point of impact of the electrons on the resistive anode to four contact electrodes mounted on their periphery of the resistive anode into the spatial coordinates of electron impact. NASA

N75-19622 *# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SENSITIVITY OF GAS FILTER CORRELATION INSTRUMENT TO VARIATIONS IN OPTICAL BALANCE
Harry D. Orr, III and Shirley A. Campbell (LTV Aerospace Corp., Hampton, Va.) 28 Jan. 1975 49 p refs
(NASA-TM-X-71997) Avail: NTIS HC $3.75 CSCL 14B

A computer program was used to simulate the response of the Gas Filter Correlation Radiometer (GFCR) to changing pollutant levels of CO, SO2, CH4, and NH3 in two model atmospheres. Positive and negative deviations of tau sub alpha of magnitudes 0.01, 0.1, and 1 percent were imposed upon the simulation and the resulting deviations in inferred concentrations were determined. For the CO, CH4, and the higher pressure cell of the NH3 channel, the deviations are less than + or - 12 percent for deviations in tau sub alpha of + or - 0.1 percent, but increase to significantly higher values for larger deviations. For the lower pressure cell of NH3 and for SO2, the deviations in inferred concentration begin to rise sharply between 0.01 and 0.1 percent deviation in tau sub alpha, suggesting that a tighter control on tau sub alpha may be required for these channels. Author

N75-19623 *# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DEVELOPMENT AND TESTING OF A PORTABLE WIND SENSITIVE DIRECTIONAL AIR SAMPLER
J. Deyo, J. Toma, and R. B. King 1975 11 p refs Proposed for presentation at 68th Ann. Meeting of the Air Pollution Control Assoc., Boston, 15-20 Jun. 1975
(NASA-TM-X-71687; E-8287) Avail: NTIS HC $3.25 CSCL 14B

A portable wind sensitive directional air sampler was developed as part of an air pollution source identification system. The system is designed to identify sources of air pollution based on the directional collection of field air samples and their analysis for TSP and trace element characteristics. Sources can be identified by analyzing the data on the basis of pattern recognition concepts. The unit, designated Air Scout, receives wind direction signals from an associated wind vane. Air samples are collected on filter slides using a standard high volume air sampler drawing air through a porting arrangement which tracks the wind direction and permits collection of discrete samples. A preset timer controls the length of time each filter is in the sampling position. At the conclusion of the sampling period a new filter is automatically moved into sampling position displacing the previous filter to a storage compartment. Thus the Air Scout may be set up at a field location, loaded with up to 12 filter slides, and left to acquire air samples automatically, according to the wind, at any timer interval desired from 1 to 30 hours. Author

N75-19624 *# Oklahoma Univ., Norman. Atmospheric Research Lab.
THE CORRELATION OF SKYLAB L-BAND BRIGHTNESS TEMPERATURES WITH ANTECEDENT PRECIPITATION
Marshall J. McFarland Feb. 1975 21 p refs
(Contract NAS9-13360)
(NASA-CR-141707; WEAT-17) Avail: NTIS HC $3.25 CSCL 14D

The S194 L-band radiometer flown on the Skylab mission measured terrestrial radiation at the microwave wavelength of 21.4 cm. The terrain emissivity at this wavelength is strongly dependent on the soil moisture content, which can be inferred from antecedent precipitation. For the Skylab data acquisition pass from the Oklahoma panhandle to southeastern Texas on 11 June 1973, the S194 brightness temperatures are highly correlated with antecedent precipitation from the preceding eleven day period, but very little correlation was apparent for the preceding five day period. The correlation coefficient between the averaged antecedent precipitation index values and the corresponding S194 brightness temperatures between 230 K and 270 K, the region of apparent response to soil moisture in the data, was -0.97. The equation of the linear least squares line is given. Author

N75-19625 *# Martin Marietta Corp., Baltimore, Md.
SKYLAB PROGRAM EARTH RESOUCES EXPERIMENT PACKAGE. VOLUME 4: SENSOR PERFORMANCE EVALUATION (S193 R/S) Final Report
Gerald P. Kenney 2 Jan. 1975 127 p refs
(Contract NAS8-24000)
(NASA-CR-141715; MSC-05546-Vol-4) Avail: NTIS HC $5.75 CSCL 14D

The results of the sensor performance evaluation of the 13.9 GHz radiometer/scatterometer, which was part of the earth resources experiment package on Skylab. Findings are presented in the areas of housekeeping parameters, antenna gain and scanning performance, dynamic range, linearity, precision, resolution, stability, integration time, and transmitter output. Supplementary analyses covering performance anomalies, data stream peculiarities, aircraft sensor data comparisons, scatterometer saturation characteristics, and RF heating effects are reported.

Results of the evaluation show that instrument performance was generally as expected, but capability degradations were observed to result from three major anomalies. Conclusions are drawn from the evaluation results, and recommendations for improving the effectiveness of a future program are offered. An addendum describes the special evaluation techniques developed and applied in the sensor performance evaluation tasks. Author

N75-19626*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SHUTTLE PROPELLANT LOADING INSTRUMENATION DEVELOPMENT
John Hamlet Jan. 1975 33 p
(NASA-TM-X-64914) Avail: NTIS HC $3.75 CSCL 14B

A continuous capacitance sensor was developed and an analog signal conditioner was evaluated to demonstrate the acceptability of these items for use in the space shuttle propellant loading system. An existing basic sensor concept was redesigned to provide capability for cryogenic operation, to improve performance, and to minimize production costs. Sensor development verification consisted of evaluation of sensor linearity, cryogenic performance, and stability during vibration. The signal conditioner evaluation consisted mainly of establishing the effects of the variations in temperature and cable parameters and evaluating the stability. A sensor linearity of 0.04 in. was achieved over most of the sensor length. The sensor instability caused by vibration was 0.04 percent. The cryogenic performance data show a maximum instability of 0.19 percent at liquid hydrogen temperature; a theoretical calibration can be computed a within 1 percent. The signal conditioner evaluation showed that, with temperature compensation, all error sources typically contribute much less than 1 percent. An estimate of the accuracy achievable with the sensor and signal conditioner shows an rss estimate of 0.75 in. for liquid oxygen and 1.02 in. for liquid hydrogen. These are approximately four times better than the shuttle requirements. Comparison of continuous sensor and discrete sensor performance show the continuous sensor to be significantly better when there is surface activity due to sloshing, boiling, or other disturbances. Author

N75-19627*# National Aeronautics and Space Administration. Pasadena Office, Calif.
FREQUENCY SCANNING PARTICLE SIZE SPECTROMETER Patent Application
Alain L. Fymat, inventor (to NASA) (JPL) Filed 26 Feb. 1975 21 p
(Contract NAS7-100)
(NASA-Case-NPO-13606-1; US-Patent-Appl-SN-553210) Avail: NTIS HC $3.25 CSCL 14B

A method and apparatus for determining the distribution of particle sizes of a scattering medium of unknown chemical composition is reported. The apparatus, a particle size spectrometer, has a fixed field of view within the forward light scattering cone at an angle between approximately 100 and 200 minutes of arc, a spectral range extending approximately from 0.2 to 4.0 inverse micrometers and a spectral resolution between about 0.1 and 0.2 micrometers. The apparatus is employed to determine the distribution of particle sizes, independently of the chemical composition of the particles, from measurements of incident light. NASA

N75-19628*# National Aeronautics and Space Administration. Pasadena Office, Calif.
PARTICLE SIZE SPECTROMETER AND REFRACTOMETER Patent Application
Alain L. Fymat, inventor (to NASA) (JPL) Filed 26 Feb. 1975 44 p
(Contract NAS7-100)
(NASA-Case-NPO-13614-1; US-Patent-Appl-SN-553209) Avail: NTIS HC $3.75 CSCL 14B

An apparatus and method are described for simultaneously and separately reconstructing the effective spectrum of sizes and refractive indices of scattering particulates of unknown chemical composition embedded in a medium such as a liquid or gas (of any arbitrary number of species). A photometer is used which has a specified narrow field of view along near-forward scattering angles variable between approximately + or - 10 degrees, preferably + or - 7.5 degrees, and an angular resolution of approximately 15 min of arc, or less. It operates at two separate wavelengths, one of which is approximately equal to 0.7 microns, or larger, but less than or equal to the expected minimum particle radius, and the other has a substantially different value from the first by an amount of at least approximately 0.2 to 0.3 microns. NASA

N75-19629*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
DETECTOR ABSORPTIVITY MEASURING METHOD AND APPARATUS Patent Application
Ronald E. Sheets, inventor (to NASA) (Tamarack Sci. Co., Inc., Orange, Calif.) Filed 19 Mar. 1975 10 p
(NASA-Case-LAR-10907-1; US-Patent-Appl-SN-559845) Avail: NTIS HC $3.25 CSCL 14B

A method and apparatus are described for measuring the absorptivity of a radiation detector by making the detector an integral part of a cavity radiometer. By substituting the detector for the surface of the cavity upon which the radiation first impinges, a comparison is made between the quantity of radiation incident upon the detector and the quantity reflected from the detector. The difference between the two is a measurement of the amount of radiation absorbed by the detector. NASA

N75-19630# National Aerospace Lab., Tokyo (Japan).
RESEARCH AND DEVELOPMENT ON A FORCE BALANCE TYPE PRESSURE TRANSDUCER FOR COMPUTER AIDED MEASUREMENTS
Masakatsu Matsuki, Tadao Torisaki, Kenji Nishio, Kitao Takahara, Takeshi Koshinuma, Hiroyuki Nouse, Takamasa Yamamoto, Fujio Mimura, Shigeo Inoue, and Hiroshi Usui Aug. 1974 23 p refs In JAPANESE; ENGLISH summary
(NAL-TR-382) Avail: NTIS HC $3.25

A force-balance type pressure transducer was designed and developed for a computer aided data processing system of jet engine component tests. Cost reduction and maintenance free mechanism of the transducer by simplifying the structure were emphasized at the design stage. Through several environment tests and endurance tests, the characteristics of this transducer were proved to be satisfactory enough for the engine component test applications. As a great deal of cost reduction of the products was achieved, economical and simultaneous acquisition of multi-pressure data is now possible by using one transducer to one pressure hole. Hence, the time required for testing an engine as well as its components is shortened and the time for data processing by a computer is also reduced. Details of the construction of the transducer and the results of the performance tests are given. Author

N75-19631*# Lockheed Electronics Co., Houston, Tex. Control Systems Development Div.
GYROFLEX DATA TRANSMITTAL AND DATA ACQUISITION SYSTEM ANALYSIS
Clarence Peckham May 1974 37 p refs
(Contract NAS9-12200)
(NASA-CR-141718; LEC-3344; JSC-08993) Avail: NTIS HC $3.75 CSCL 14B

Data obtained from the evaluation of GYROFLEX gyro is presented herein, along with a description of the data acquisition system. In addition, the appendices contain an analysis of the voltmeter used for data collection, and the filtering technique employed. It is shown that the test setup is satisfactory for testing GYROFLEX gyros. Author

N75-19632*# Alabama Univ., University. Bureau of Engineering Research.
EXPERIMENTAL APPROACH TOWARD HOLOGRAPHIC INTERFEROMETRIC FRINGE INTERPRETATION Interim Report
Hua-Kuang Liu Jul. 1974 25 p refs
(Contract NAS8-30479)
(NASA-CR-120707; BER-175-74) Avail: NTIS HC $3.25 CSCL 14E

Current literature concerning the measurement of small displacements by the laser holographic technique was reviewed. It was found that existing theories are extremely difficult, if not impossible, to apply to any realistic nondestructive testing conditions in which the geometries of the objects are complex

and the three-dimensional displacements are irregular. An experimental approach was adopted for interpreting correlation between real time holographic fringe patterns and small displacements. Preliminary results show that the present method is feasible for the quantitative interpretation of the fringes as well as the calibration of the mobile HNDT system. Author

N75-19633# Danish Research Center for Applied Electronics, Hoersholm.
TEMPERATURE PROFILING BY INFRARED MICROSCOPE [TEMPERATURMALING MED INFRARODT MIKROSKOP]
Erik Slettan Nov. 1974 17 p In DANISH
(ECN-10) Avail: NTIS HC $3.25

Profiling of the infrared radiative emission from an electronically charged material provides for a survey of temperature parameters and the detection of overloads and hot spots. Example measurements on an aluminum oxide thin film substrate are included. Transl. by G.G.

N75-19634*# Stanford Univ., Calif. Dept. of Electrical Engineering.
RESEARCH ON PRESSURE SENSORS FOR BIOMEDICAL INSTRUMENTS Final Report
James B. Angell 19 Feb. 1975 7 p refs
(Grant NGL-05-020-401)
(NASA-CR-142351) Avail: NTIS HC $3.25 CSCL 06B

The development of a piezo-resistive pressure transducer is discussed suitable for recording pressures typically encountered in biomedical applications. The pressure transducer consists of a thin silicon diaphragm containing four strain-sensitive resistors, and is fabricated using silicon monolithic integrated-circuit technology. The pressure transducers can be as small as 0.7 mm outer diameter, and are, as a result, suitable for mounting at the tip of a catheter. Pressure-induced stress in the diaphragm is sensed by the resistors, which are interconnected to form a Wheatstone bridge. Author

N75-19635# Bendix Corp., Kansas City, Mo.
TRANSDUCER FOR GAGING PRESSURE SENSITIVE PARTS Final Report
W. G. Eby Nov. 1974 46 p refs
(Contract AT(29-1)-613)
(BDX-613-879-Rev) Avail: NTIS HC $3.75

A low contact force, linear, variable displacement transformer was developed. This air actuated transducer is wholly pneumatic and is capable of developing a contact force ranging from 0.7 to 1.5 grams regardless of its attitude. Because the outside diameter of the case is 0.5 inch (12.7 mm), the unit is readily adaptable to existing fixtures. Author (NSA)

N75-19636# Sandia Labs., Albuquerque, N.Mex.
THIN-FILM RADIATIVE-PULSE CALORIMETER USING A DIFFERENTIALLY TRANSPARENT BARRIER
W. P. Schimmel, Jr. and A. B. Donaldson Nov. 1974 15 p refs
(Contract AT(29-1)-789)
(SAND-74-0298) Avail: NTIS HC $3.25

A two-wavelength model is applied to the analytical consideration of the radiant heat transfer occurring when a solid, which is covered by a differentially transparent barrier, is irradiated with a large pulse of visible energy. By two-wavelength and differentially transparent, it is assumed that the barrier is essentially transparent in the visible portion of the spectrum but opaque in the infrared. The longer wavelength radiation emitted by virtue of the solid's temperature is thus suppressed. Comparison is made with an unprotected sample to show that optical tamping is possible if the barrier is properly chosen. Author (NSA)

N75-19637# Bendix Corp., Kansas City, Mo.
HOLOGRAPHIC INTERFEROMETRY Final Report
M. P. Schoeppner, C. E. Watterson, and M. C. Collins Nov. 1974 63 p refs Revised
(Contract AT(29-1)-613)
(BDX-613-967-Rev) Avail: NTIS HC $4.25

A capability for performing nondestructive holographic tests on various products and materials was developed. The principles, laboratory implementation, and use of holographic interferometry in detecting internal defects and strain anomalies in composite structures are described. Author (NSA)

N75-19638# California Univ., Livermore. Lawrence Livermore Lab.
HIGH SPEED RADIATION CAMERA USING A PTM RUBY LASER AND HYDRATED ELECTRON ABSORPTION PHENOMENA
G. W. Coutts and L. B. Olk 11 Jul. 1974 11 p refs Presented at 11th Intern. Congr. on High Speed Photography, London, 15-21 Sep. 1974 Sponsored by ERDA
(UCRL-75756; Conf-740915-1) Avail: NTIS HC $3.25

A twelve-frame radiation camera incorporating a pulse transmission mode ruby laser and employing the transient absorption phenomena associated with the hydrated electron is described. The camera was developed in an attempt to circumvent timing limitations imposed by scintillators and gated image intensifiers. The exposure time for this system is limited by the laser pulse width and the mean lifetime of the hydrated electron absorption centers. High resolution photographs of a Febetron 705 pulsed electron beam interacting with aqueous solutions were obtained. Images obtained during the rise of the electron pulse indicate a sharp increase in the electron energy. Photographs obtained during the pulse decay indicate a large number of relatively lower energy electrons. Author (NSA)

N75-19639# Oak Ridge Y-12 Plant, Tenn.
DEVELOPMENT OF A MACHINE TOOL SYSTEM WHICH UTILIZES ULTRASONIC THICKNESS GAGING TO MACHINE THE WALL OF CYLINDERS TO CONSTANT THICKNESS
L. E. Carey 9 Oct. 1974 55 p refs
(Contract W-7405-eng-26)
(Y-1954) Avail: NTIS HC $4.25

A machine-tool system which utilizes ultrasonic gaging to machine the walls of cylinders to a constant thickness is described. The machining system is used to machine the outside surface of a cylinder after the inner surface has been machined by conventional methods. One ultrasonic transducer and two thickness gages are used to continuously measure the distance to the inner surface of a cylinder. The pulsed-echo technique is used to measure thicknesses, and the output of the thickness gages continuously controls the position of the tool. A fast-response electrohydraulic servo swiftly moves the cutting tool in response to the movement of the back surface of the rotating cylinder. The cutting tool is continuously controlled to maintain constant distance from the inner surface of the cylinder as it rotates in a lathe. The front surface of the cylinder is machined identically to the back surface, and the cylinder thus has a wall of uniform thickness. Author (NSA)

N75-19640# Oak Ridge National Lab., Tenn.
TECHNIQUE FOR DETERMINING THERMAL AND ELECTRICAL CONDUCTIVITY AND ABSOLUTE SEEBECK COEFFICIENT BETWEEN 300 AND 1000 K
J. P. Moore, D. L. McElroy, and R. S. Graves Sep. 1974 47 p refs
(Contract W-7405-eng-26)
(ORNL-4986) Avail: NTIS HC $3.75

A guarded longitudinal-heat-flow technique for measuring thermal conductivity, electrical resistivity, and Seebeck coefficient on small rods between 300 and 1000 K is described. The thermal conductivity of the powder insulation in the system annuli was low enough to permit use of the thin-rod approximation for calculating the thermal conductivity of metals. The apparatus was tested with an Armco iron reference specimen. One test was performed with the specimen brazed onto heater and heat sink, and results from this test were within the determinate error. Measurements on the reference specimen when it was threaded onto heater and heat sink produced electrical resistivity and Seebeck coefficient results that agreed with those from the brazed specimen to within determinate error but produced thermal conductivity results that were 2 to 6% above the reference values. Author (NSA)

N75-19641# California Univ., Livermore. Lawrence Livermore Lab.
HANDY GUIDE TO THE PRESHOT ANALYSIS FOR

INTERFEROMETRIC MEASUREMENTS
M. Kamegai 4 Apr. 1974 13 p ref
(Contract W-7405-eng-48)
(UCID-16622) Avail: NTIS HC $3.25

Methods of preshot analysis for measurements that require a laser Doppler interferometer are described. Prior to the experiment, the velocity history to be measured is calculated and then the calculated velocities are translated into an interferometric fringe pattern. Such an approach to interferometric measurements is useful when an attempt is made to measure complex velocity profiles where the frequency of the signals to be recorded varies greatly during the measurement. In such an experiment the frequency can exceed the bandwidth of the photomultiplier and an analysis of the interferometric data avoids the risk of losing important data by properly adjusting the interferometer before the experiment. Author (NSA)

N75-19642# Naval Air Development Center, Warminster, Pa. Air Vehicle Technology Dept.
DEVELOPMENT OF AN ADVANCED STRAIN LEVEL RECORDER Final Report
David E. Weiss 7 Oct. 1974 16 p refs
(F41422209)
(AD-A001689; NADC-74163-30) Avail: NTIS CSCL 14/3

An airborne strain level recorder has been developed for monitoring structural fatigue in aircraft. Sequential recording of strain level exceedances is made on a magnetized disc. The report contains a description of the system and of laboratory evaluation tests. GRA

N75-19643# Army Foreign Science and Technology Center, Charlottesville, Va.
THE EFFECT OF DIRECTIONAL DEVELOPMENT
I. Blyumberg 3 Oct. 1973 19 p refs Transl. into ENGLISH from Tekh. Kino i Televideniya (USSR), v. 14, no. 11, 1970 p 14-21
(AD-A001731) Avail: NTIS CSCL 14/5

The permissible values of the directional effect in cinematography were approximately determined. The appearance of the directional effect in movie positives can be obviated by using speeds of film movement = 2,000 meters/hr for Metol hydroquinone developers and speeds = 1,000 meters/hr for Phenidone hydroquinone developers. The appearance of the effect in movie negatives can be averted only by using spray-bath development. An attempt was made to quantitatively evaluate the conditions of the movement of the developer in the developing machine and the relation between the directional effect and the width of the photographic layer. GRA

N75-19644# Sandia Labs., Albuquerque, N.Mex.
AN INEXPENSIVE AERIAL PENETROMETER Final Report, Feb. 1970 - Dec. 1973
V. R. Marien and V. Hansen Oct. 1974 74 p
(Contract F29601-70-F-0004; AF Proj. 683M)
(AD-A002153; AFWL-TR-74-56) Avail: NTIS CSCL 01/5

A research effort was conducted to establish the feasibility of and develop an inexpensive air-dropped penetrometer that can provide accurate measures of aircraft performance on unsurfaced airfields. This report describes the terradynamic, aerodynamic, structural, and telemetry system designs for the penetrometer and the results of field tests with a number of prototype units. Relationships are developed between the performance of the penetrometers and standard measures of trafficability. The feasibility of the use of a penetrometer system has been established. However, additional testing under field conditions is required to optimize the penetrometers operation before operational units can be produced. GRA

N75-19645# Denver Univ., Colo. Dept. of Physics and Astronomy.
LIQUID HELIUM COOLED BALLOON-BORNE GRATING SPECTROMETER SYSTEM Final Report, 29 Jun. 1972 - 28 May 1974
Walter J. Williams, John J. Kosters, James N. Brooks, and David G. Murcray Oct. 1974 18 p refs
(Contract DAAD05-72-C-0364; DA Proj. 1T1-61102-B-53A)
(AD-A002009; BRL-CR-186) Avail: NTIS CSCL 14/2

A Littrow grating spectrometer designed to operate in a liquid helium dewar at a temperature of 4K was constructed as the major effort in this program. The problems associated with construction of such an instrument and the methods used to solve them are discussed. The spectrometer was designed to be used on a balloon-borne platform and to measure the atmospheric emission as a function of wavelength and altitude. Use of the spectrometer in this fashion requires that the liquid helium dewar used to house the spectrometer be equipped with an appropriate infrared window. This window is a source of background noise for the spectrometer and in order to achieve sensitivity the window is cooled by liquid nitrogen to 77K. Techniques for keeping atmospheric H2O and CO2 from freezing on to the window were developed and incorporated into the final balloon-borne system. GRA

N75-19646# Comstock and Wescott, Inc., Cambridge, Mass.
ROCKET-BORNE SOLAR EXTREME ULTRAVIOLET DOUBLE SPECTROPHOTOMETER Final Report, 1 Mar. 1972 - 30 Jun. 1974
Joseph P. Padur and John F. McGrath 31 Jul. 1974 95 p refs
(Contract F19628-72-C-0254; AF Proj. 6688)
(AD-A001759; AFCRL-TR-74-0397) Avail: NTIS CSCL 14/2

The report describes the design, development, and fabrication of a solar extreme ultraviolet double spectrophotometer for sounding rockets. The instrument consists of a grazing-incidence grating spectrophotometer (Type I), a normal-incidence grating spectrophotometer (Type II), and an auxiliary ultraviolet photometer. The report also describes the design and fabrication of ground support equipment (GSE) for the two instruments and field services supporting the launch of the instrument. GRA

N75-19647# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
THE USE OF REMOTE SENSING SYSTEMS FOR ACQUIRING DATA FOR ENVIRONMENTAL MANAGEMENT PURPOSES. REPORT 1: A PROCEDURE FOR PREDICTING IMAGE CONTRASTS IN PHOTOGRAPHIC REMOTE SENSOR SYSTEMS
Lewis E. Link, Jr. Nov. 1974 165 p refs
(DA Proj. 4A1-62121-A-896)
(AD-A002070; AEWES-TR-M-74-8-1) Avail: NTIS CSCL 14/5

Airborne remote sensors provide a potentially expedient technique for obtaining environmental data for baseline descriptions of multi purpose military installations or of impact of activities on the environment within a reasonable time and cost framework. Although the feasibility of using remote sensing techniques for these purposes has been demonstrated, the acquisition of imagery of sufficient quality to provide the necessary data for the many and diverse environmental features and phenomena of interest requires systematic and quantitative planning. This report presents an analytical procedure (referred to herein as the remote sensing simulation model) that provides a means for selecting a sensor system and mission profile objectively to enhance imagery for specific purposes. The model is computerized and calculates the amount of contrast that will occur between two features of interest on a photographic image as a function of reflectance properties of materials, atmospheric conditions, solar zenith angle, sensor altitude, and sensor characteristics. Illustrations of model application to two hypothetical problems are given. The remote sensing simulation model provides a general tool for acquisition of photographic remote sensing techniques and evaluation of the applicability of these techniques to specific or general problem areas. GRA

N75-19648# Naval Research Lab., Washington, D.C.
A BLIP-SCAN RATIO SCORING SYSTEM Final Report
F. D. Queen and E. E. Maine, Jr. Dec. 1974 19 p
(AD-A002728; NRL-MR-2916) Avail: NTIS CSCL 14/3

A digital recording system for use in determining the blip-scan ratio of search radars was designed and constructed. The system accepts input from as many as seven operators observing one or more radars. Each operator has a choice of three input levels or designations. The design rationale is discussed, as are operating characteristics. A separate input channel accepts target range and bearing information from a console keyboard. The data recording is accomplished using a seven track IBM compatible

format. The structure of the recorded information is presented along with a method for retrieving and processing the information. Other possible applications of the system are pointed out. GRA

N75-19649# Army Foreign Science and Technology Center, Charlottesville, Va.
AUTOMATION IN PRINTING NEGATIVES OF VARYING DENSITY
N. V. Malov 25 Feb. 1974 7 p Transl. into ENGLISH from Mat. 8th Zon. Nauch. Metod. Konf. (Irkutsk), 1966 p 50-52 (AD-A002640; FSTC-HT-23-1754-73) Avail: NTIS CSCL 14/5

For normal slide preparation, simultaneous printing of frames from negatives is hindered by variations of densities in individual frames. A masking method has been developed. A mask is made for each frame, and it is placed in the printing machine with the negative film, and automatic light control is provided for the final printing. GRA

N75-19650# Naval Ship Research and Development Center, Bethesda, Md.
DEFLECTION, STRESS, AND VIBRATION ANALYSIS OF ROTATING PROPELLERS USING HOLOGRAPHY
Jerome P. Sikora, Herbert A. Peterson, and Frederick T. Mendenhall, Jr. Nov. 1974 28 p refs
(AD-A002710; NSRDC-4507) Avail: NTIS CSCL 20/4

A new holographic technique has been developed which allows measurement of the deflection of propeller blades while rotating. The technique requires that an axially-symmetric wavefront be directed onto both the propeller blade and a holographic plate rotating with the propeller. Some deflection results for a propeller rotating in air are presented and the technique has been shown to be feasible for propellers rotating in water. GRA

N75-19651# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
DEVELOPMENTS IN HIGH PRESSURE AND HIGH RATE AIR MASS FLOW CALIBRATION SYSTEMS AT THE AIR FORCE FLIGHT DYNAMICS LABORATORY, PHASE 2 Final Report, Aug. 1970 - May 1974
D. W. Young Oct. 1974 60 p refs
(AF Proj. 1426)
(AD-A002628; AFFDL-TR-74-99) Avail: NTIS CSCL 14/2

Development of a system based on a weighing technique and used for calibration of high pressure, high flow rate, air mass flowmeters is described. Phase 1 of this report pertained to the calibration system which was based on the pressure rise method. Flowmeters calibrated with these two systems have been used in the reported tests. Flow rates covered in evaluation of the weighing system ranged from 3.5 to 34.0 pounds per second at upstream pressures from 1,000 to 4,700 psi. Simultaneous calibrations were made with these two basically different calibration systems, and results are included which show the agreement between them. Operational difficulties and changes made to improve the systems are included. GRA

N75-19317 Giessen Univ. (West Germany). Inst. fuer Physik.
DETAILED DESCRIPTION OF A SPACE-PROCESSING FURNACE
R. Grasser and A. Scharmann *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 327-334 refs (For availability see N75-19285 11-12)

N75-20203 Joint Publications Research Service, Arlington, Va.
HUNGARIAN DESIGN INSTRUMENT PACKAGE FOR INTERKOSMOS-12
In its Transl. on Eastern Europe: Sci. Affairs, No. 455 (JPRS-64146) 21 Feb. 1975 p 11-12 Transl. into ENGLISH from Magyar Ifjusag (Budapest), no. 3, 17 Jan. 1975 p 17-18 (For availability see N75-20201 11-99)

N75-20211 European Space Research Organization, Paris (France).
APPLICATION OF THE ELECTRET EFFECT TO MINIATURE TRANSDUCERS
Jean-Claude Alliot *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1974-2 (ESRO-TT-113) Dec. 1974 p 60-85 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1974-2, Mar.-Apr. 1974 p 95-105 (For availability see N75-20207 11-99)

36 LASERS AND MASERS

Includes parametric amplifiers.

N75-19652* National Aeronautics and Space Administration, Pasadena Office, Calif.
DEEP TRAP, LASER ACTIVATED IMAGE CONVERTING SYSTEM Patent
Joseph Maserjian, inventor (to NASA) (JPL) Issued 11 Feb. 1975 6 p Filed 22 Aug. 1973 Supersedes N73-31467 (11 - 22, p 2680 Sponsored by NASA
(NASA-Case-NPO-13131-1; US-Patent-3,865,975; US-Patent-Appl-SN-390468; US-Patent-Class-178-7.1; US-Patent-Class-250-211R; US-Patent-Class-250-578; US-Patent-Class-315-169R; US-Patent-Class-340-173LS) Avail: US Patent Office CSCL 20E

Receiving an optical image on the surface of a photoconducting semiconductor is presented, storing the image in deep traps of the semiconductor, and later scanning the semiconductor with a laser beam to empty the deep traps, thereby producing a video signal. The semiconductor is illuminated with photons of energy greater than the band gap producing electron-hole pairs in the semiconductor which subsequently fill traps in energy from the band edges. When the laser beam of low energy photons excites the trapped electrons and holes out of the traps into the conduction and valence bands, a photoconductivity can be observed. Official Gazette of the U.S. Patent Office

N75-19653* National Aeronautics and Space Administration, Washington, D.C.
LASER SYSTEM WITH AN ANTIRESONANT OPTICAL RING Patent
Anthony E. Siegman, inventor (to NASA) (Stanford Univ.) Issued 4 Mar. 1975 9 p Filed 2 Nov. 1973 Supersedes N74-20118 (12 - 11, p 1303) Sponsored by NASA
(NASA-Case-HQN-10844-1; US-Patent-3,869,210; US-Patent-Appl-SN-412080; US-Patent-Class-356-106LR) Avail: US Patent Office CSCL 20E

Various applications of an antiresonant ring, consisting of a beam splitter and a number of optical reflectors, are described. With a beam splitter having a transmission coefficient and a reflection coefficient, an optical beam incident on the beam splitter along a first axis is split into two components which circulate around the ring in opposite directions. They are recombined to reflect back the beam along the first axis, with none of the beam power being directed along a second axis. The ring can be part of the cavity of two otherwise independent lasers, with two separate laser mediums external to the ring, or with a multi-wavelength laser medium in the ring. The ring together with a second-harmonic generation crystal and a dispersive phase shifter in the ring can generate the second harmonic of an optical beam. Official Gazette of the U.S. Patent Office

N75-19654* National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.
DUALLY MODE LOCKED Nd:YAG LASER Patent
John Osmundson (NAS-NRC), H. Edward Rowe (NAS-NRC), and Dominick Santarpia, inventors (to NASA) (NAS-NRC) Issued 4 Mar. 1975 6 p Filed 31 Aug. 1973 Supersedes N73-32398 (11 - 23, p 2800) Sponsored by NASA
(NASA-Case-GSC-11746-1; US-Patent-3,869,680; US-Patent-Appl-SN-393528; US-Patent-Class-331-94.5M) Avail: US Patent Office CSCL 20E

A dually mode locked laser system is disclosed: the laser system is of the general type including a laser cavity defined by a pair of at least partially reflecting mirrors with a laser material disposed in the cavity. A loss modulator mode locking element and a phase modulator mode locking element are disposed in the laser cavity in optical series with one another. Modulation drive signals are provided for each mode locking element such that each element produces an output pulse train of substantially the same repetition rate and where the output pulse train is in

a timed interrelationship such that the pulses pass through both mode locking elements without being extinguished. The loss mode locker is driven at a low level so that relaxation oscillations do not occur and forces the pulses generated by the phase mode locker to maintain a constant phase relative to the mode lock drive signal. The laser system can be run both open loop and with a phase lock stabilization feedback loop.
Official Gazette of the U.S. Patent Office

N75-19655* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
LASER HEAD FOR SIMULTANEOUS OPTICAL PUMPING OF SEVERAL DYE LASERS Patent
Peter B. Mumola and Belton T. McAlexander, inventors (to NASA) Issued 25 Feb. 1975 6 p Filed 5 Jun. 1973 Supersedes N73-25564 (11 - 16, p 1923)
(NASA-Case-LAR-11341-1; US-Patent-3,868,591; US-Patent-Appl-SN-367293; US-Patent-Class-331-94.5P; US-Patent-Class-330-4-3) Avail: US Patent Office CSCL 20E

The invention is a laser head for simultaneous pumping several dye lasers with a single flash lamp. The laser head includes primarily a multi-elliptical cylinder cavity with a single flash lamp placed along the common focal axis of the cavity and with capillary tube dye cells placed along each of the other focal axes of the cavity. The inside surface of the cavity is polished. Hence, the single flash lamp supplies the energy to the several dye cells. Official Gazette of the U.S. Patent Office

N75-19656 California Univ., Irvine.
PARTIALLY HOMOGENEOUSLY BROADENED GAS LASER AMPLIFIERS: MODELLING AND EXPERIMENTAL APPLICATIONS Ph.D. Thesis
John Speight Ostrem 1974 112 p
Avail: Univ. Microfilms Order No. 74-27843

The operating behavior of partially homogeneously broadened gas laser amplifiers are modeled and methods are developed for determining laser parameters. The methods are based on analysis of the experimental measurements of the gain at the line center versus input intensity, and of spectral line narrowing as a function of plasma length. Formulas are derived for the gain and refractive index of a gas laser amplifier employing a semiclassical approach. These results are applied to an analysis of the spectral line narrowing of superradiant radiation in high-gain laser amplifiers. A quadratic approximation to the gain is developed and is employed with the spectral line-narrowing analysis to determine laser parameters of interest. Application of the Voigt function and its properties to the analysis of spectral profiles is discussed. Making use of certain properties of the Voigt function and utilizing numerical techniques, spectroscopic information is obtained about the laser transition. Numerical methods are presented for computing the Voigt function, its Hilbert conjugate, and associated functions that arise in the modelling of laser amplifiers. A FORTRAN program is included.
Dissert. Abstr.

N75-19657*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
A TUNABLE LINE FILTER POLYCHROMATOR FOR GAS TEMPERATURE MEASUREMENTS USING LASER RAMAN SCATTERING
Jack J. Grossman and M. Muramoto Mar. 1975 32 p refs (Contract NAS3-17818)
(NASA-CR-134771; MDC-G5764) Avail: NTIS HC $3.75 CSCL 20E

A proprietary laser line filter spectrograph (LLFS) was modified to test for improved remote measurement of atmospheric temperature by Raman spectroscopy of the rotational bands of N2 and O2. Both grating scan measurements with fixed PMT and polychromator image plane PMT scans with fixed grating setting were made using HeNe and Ar(+) lasers. The LLFS was found to have a laser line rejection ratio at 6A from the laser line and provides resolved rotational Raman spectral display at the polychromator exit plane. Spectral resolution is adequate to measure and correct for background in the Stokes spectrum. It is anticipated that this system should allow measurement of gas or atmospheric temperature to + or - 1 C. Author

N75-19658# Communications Research Centre, Ottawa (Ontario).
FEASIBILITY STUDIES OF CW OPERATION OF A TRANSVERSE FLOW LIQUID LASER SYSTEM
Elmer H. Hara Oct. 1974 31 p refs
(CRC-1258) Avail: NTIS HC $3.75

In order to test the possibility of operating the NA(3+):POCl3:ZRCl4 liquid laser material as a continuous wave (CW) laser under xenon arc lamp excitation, a liquid laser cell was constructed and tested. The liquid was made to flow transverse to the axis of the optical cavity. The large temperature coefficient for the index of refraction and small value for the heat capacity per unit volume of the laser liquid combined to make the optical homogeneity of the liquid very sensitive to temperature changes. It was concluded that CW operation of the liquid laser with arc lamp excitation will be extremely difficult to achieve. Author

N75-19659# Communications Research Centre, Ottawa (Ontario).
A DOPPLER-FLOWMETER STUDY OF A TRANSVERSE-FLOW LIQUID LASER CELL
E. H. Hara Oct. 1974 50 p refs
(CRC-1259) Avail: NTIS HC $3.75

The flow characteristics of a liquid laser cell were investigated by a laser-Doppler flowmeter. Water was used as the test liquid. Laminar flow characteristics were compared with those of turbulent flow which was generated by placing a fine wire mesh at the entrance port of the cell. The heating effects of the xenon arc lamps, which are used for excitation of the laser material, were investigated. It was found that the arc lamps did not significantly affect the flow characteristics of both the laminar and the turbulent flow cases. It was concluded that, provided the liquid laser material has similar thermal characteristics to that of water, laminar flow should be satisfactory for the operation of a transverse flow liquid laser. Author

N75-19660# Kozponti Fizikai Kutato Intezet, Budapest (Hungary).
INTERFEROMETRIC LINEWIDTH MEASUREMENTS ON THE 5378 A LINE OF THE He-Cd ION LASER
T. Salamon, E. Lorincz, L. Csillag, and K. Rozsa 1974 9 p refs Partly in HUNGARIAN, RUSSIAN and ENGLISH
(KFKI-74-28) Avail: ERDA Depository Libraries HC $4.00

The linewidths 53 + or - 18 MHz and 47 + or - 12 MHz on lambda = 5378 A were measured of a hollow cathode, dc-excitation, Cd ion laser at pressures 20 and 60 torrs, respectively. This shows that the laser is operating in single mode within a large pressure range. Interferometric measurements on the spontaneous transition indicate large homogeneous broadening which has been accepted as the main reason of the single mode laser generation. Author (NSA)

N75-19661# Sandia Labs., Albuquerque, N.Mex.
COMPUTER-BASED DIAGNOSTICS FOR THE SANDIA FOUR-BEAM LASER
W. B. Boyer, R. F. Davis, and J. L. Krone 1974 16 p Presented at CUBE Symp., Livermore, Calif., 23 Oct. 1974 Sponsored by ERDA
(SAND-74-5550; Conf-741001-2) Avail: NTIS HC $3.25

The Sandia Four-Beam Laser facility is briefly described and the need for diagnostic instrumentation is discussed. The on-line computer system which supports this instrumentation is then described. Significant problems affecting the design of the instrumentation equipment are discussed, followed by descriptions of the actual equipments which were built and the associated interfacing techniques. Author (NSA)

N75-19662# Oak Ridge Y-12 Plant, Tenn.
SURFACE CHARACTERISTICS OF DIAMOND TURNED LASER OPTICS
R. E. Sladky, J. B. Arnold, H. S. Corey, and P. J. Steger 1974 26 p refs Presented at the 6th Ann. Conf. on Surface Studies, Oak Ridge, Tenn., 10-12 Sep. 1974
(Contract W-7405-eng-26)
(Y-DA-5993; Conf-740943-1) Avail: NTIS HC $3.75

The high energy laser program requires large diameter metal mirrors capable of superior optical performance. One of the methods of obtaining these mirrors is by diamond turning, which can be described as superfinishing a metal surface by

single-point tooling. Flat and curved surfaces from one-cm to 40-cm diameter with a surface finish better than 25 angstroms RMS were produced in Y-12. The surface finish, light scattering, reflectivity, and absorptivity of many of these surfaces were measured by several laboratories. Instrumental methods and a summary of the results are presented. Author (NSA)

N75-19663# Max-Planck-Institut fuer Plasmaphysik, Garching (West Germany).
PULSED HIGH POWER IODINE LASER AT IPP
G. Brederlow, K. Hohla, and K. J. Witte Jun. 1974 15 p refs Presented at the 7th European Conf. on Plasma Prod. by High Power Lasers, Garching, W. Ger., 22-26 Apr. 1974
(IPP-IV-74; Conf-740439-3) Avail: ERDA Depository Libraries HC $4.00

The basic features of the iodine laser as a high power laser are reported. The scaling laws for the dimensions of an iodine laser amplifier are given. The two laser systems Asterix 2 (100 J/1 nsec) already existing and Asterix 3 (1 kJ/1 nsec) being constructed are described in detail. Author (NSA)

N75-19664# California Univ., Livermore. Lawrence Livermore Lab.
PROSPECTS FOR GASEOUS RARE EARTH LASERS
W. F. Krupke 11 Sep. 1974 28 p refs
(Contract W-7405-eng-48)
(UCID-16620) Avail: NTIS HC $3.75

It is shown that many of the characteristics of the RE-trihalides, RE-Al-Cl complexes, and RE(thd)3 systems are supportive of laser action. It is pointed out that consideration should not be limited to Nd(3+) alone, since dynamically, other ions radiating in the visible (Ce, Eu and Tb) with low lying 4F yields 5d pump bands may succeed where Nd fails. One should probably investigate the Nd-Al-Cl complexes first, since they seem reasonably tractable. AlCl3 additives to liquid phosphor oxychloride did not deactivate the 4F(3/2) manifold, and presumably will act similarly in the vapor phase. Other metal halides can also be utilized perhaps providing greater optical transition strengths, greater RE vapor pressures at a given temperature, or lower background pressures for a given storage. Author (NSA)

N75-19665# California Univ., Livermore. Lawrence Livermore Lab.
LASER INTENSITY MEASUREMENT
R. A. Saroyan 2 Aug. 1974 48 p refs
(Contract W-7405-eng-48)
(UCID-16550) Avail: NTIS HC $3.75

A method for obtaining laser intensity measurements was developed and experimentally tested. A photographic plate is used to record the far-field laser intensity distribution. By using a multiple image technique the image is self calibrated. The computer program that processes the photographic density data produced by a scanning microdensitometer is also described. The program provides relative and absolute intensity distribution information. Data produced by this method are presented.
Author (NSA)

N75-19666# California Univ., Livermore. Lawrence Livermore Lab.
DAMAGE STUDIES AT 1.06 MICROMETERS WITH 100 TO 200 PS PULSES
G. W. Leppelmeier and M. Finkelstein 25 Jun. 1974 11 p ref Presented at ASTM Workshop, Boulder, Colo., 22 May 1974 Sponsored by ERDA
(UCRL-75631; Conf-740524-5) Avail: NTIS HC $3.25

Studies were conducted of the damage threshold at 1.06 microns of multi-layer dielectric films used as polarizing beamsplitters, mirrors, and anti-reflection coatings, K(H(X)...D(2-X))PO4, several high Verdet constant glasses, and micromachined silver. The laser pulse used had less than 4% spatial and temporal ripple. Pulse energy of up to 1 joule permitted using a collimated beam. Damage thresholds in the range 1-5 J/sq cm were obtained. Author (NSA)

N75-19667# California Univ., Livermore. Lawrence Livermore Lab.
RARE EARTH LASERS
M. J. Weber Aug. 1974 11 p refs Presented at the 11th Rare Earth Res. Conf., Traverse City, Mich., 7-10 Oct. 1974 Sponsored by AEC
(UCRL-76062; Conf-741002-11) Avail: NTIS HC $3.25

A tabulation of rare-earth laser ions, types of hosts employed, and rare earths used as sensitizer ions is given. Some brief comments regarding the various types of rare-earth lasers are also given. The spectral range of these lasers extends from 0.5 to 3.0 micrometers. The operating wavelengths of some selected rare-earth lasers are listed. Author (NSA)

N75-19668# General Electric Co., Pittsfield, Mass. Ordnance Systems.
DEVELOPMENT OF A GAS LASER SYSTEM TO MEASURE TRACE GASES BY LONG PATH ABSORPTION TECHNIQUES. VOLUME 1: GAS LASER SYSTEM MODIFICATIONS FOR OZONE MONITORING Final Report
S. E. Craig, D. R. Morgan, D. L. Roberts, and L. R. Snowman Jun. 1974 126 p refs 2 Vol.
(Contract EPA-68-02-0757)
(PB-236678/9; OS-74-13-Vol-1; EPA-650/2-74-046-A) Avail: NTIS HC $5.75 CSCL 14B

Modifications of a gas laser system for long path monitoring of trace atmospheric constituents by infrared absorption are described. Modifications were made in preparation for an ozone field measurement program wherein path monitor data were compared with those from a point monitor moved along the optical path. System modifications included incorporating a digital signal processor in the system and a spatial filter in the laser beam. Spectral studies of ozone, carbon dioxide, water vapor, ethylene and ammonia are presented in connection with the selection of laser wavelengths used in the system to discriminate ozone effects from interferences. Design considerations and a proposed configuration for an isotopic CO2 laser are presented.
GRA

N75-19669# General Electric Co., Pittsfield, Mass. Ordnance Systems.
DEVELOPMENT OF A GAS LASER SYSTEM TO MEASURE TRACE GASES BY LONG PATH ABSORPTION TECHNIQUES. VOLUME 2: FIELD EVALUATION OF GAS LASER SYSTEM FOR OZONE MONITORING
W. A. McClenny, F. W. Baity, Jr., R. E. Baumgardner, Jr., R. A. Gray, and R. J. Gillmeister Jul. 1974 52 p refs 2 Vol.
(Contract EPA-68-02-0757)
(PB-236679/7; EPA-650/2-74-046-b-Vol-2) Avail: NTIS HC $4.25 CSCL 14B

Ambient ozone measurements in real time using an open-path monitor are described. These studies establish the sensitivity of an open-path monitor, based on transmissivity measurements of CO2 laser lines, less than or equal to 5 ppb and validate the values obtained during real-time monitoring of ambient ozone by establishing and using a methodology for the comparison of point monitor readings and open-path monitor readings over a common path. GRA

N75-19670# Wisconsin Univ., Madison. Dept. of Chemistry.
CHEMICAL LASER STUDIES OF ENERGY PARTITIONING INTO CHEMICAL REACTION PRODUCTS
Michael J. Berry Oct. 1974 78 p refs
(Contract N00014-67-A-0128-0022; NR Proj. 051-521)
(AD-A000958; TR-4) Avail: NTIS CSCL 07/4

Chemical laser techniques for the determination of energy partitioning into individual degrees-of-freedom of chemical reaction products are reviewed. Selected studies are described and, in addition, all energy partitioning results derived from chemical laser investigations of bimolecular, unimolecular, and photochemical reactions (complete through December, 1973) are tabulated.
GRA

N75-19671# East Carolina Univ., Greenville, N.C. Dept. of Physics.
SOFT X-RAY TRAVELING WAVE AMPLIFIER Final Report
James M. Joyce and Richard A. McCorkle Oct. 1974 18 p refs
(Grant DA-ARO(D)-31-124-G125)
(AD-A001132; ECU-128; ARO-109022-P) Avail: NTIS CSCL 20/5

Threshold conditions for obtaining amplified spontaneous

emission of X radiation, inclusive of strong line broadening and loss processes, are presented and evaluated for the case of pumping by ion-atom--ion-ion collisions. Quasistatic as well as pulsed operation of such X-ray lasers is seen to be realizable in terms of currently operative plasma systems. Suggestions concerning additional work are included. GRA

N75-19672# Naval Weapons Center, China Lake, Calif.
RAPID ACOUSTOOPTIC TUNING OF A DYE LASER
Lynn D. Hutcheson and R. S. Hughes Nov. 1974 28 p refs
(AD-A002441; NWC-TP-5701) Avail: NTIS CSCL 20/5

Rapid tuning of a dye laser over a large wavelength range has been achieved by inserting an acoustooptic deflector between the dye cell and a diffraction grating. The deflector and grating combination serve as the tuning element. TeO2, which has an anomalously low sound velocity, has been used to demonstrate acoustooptical tuning over a broad spectral range. Theoretically, tuning rates greater than 100 nm/microsec can be achieved over a wavelength range of up to 35 nm. The experimental data have been used to verify the analytical aspects of the beam deflector and diffraction grating configuration. GRA

N75-19673# California Inst. of Tech., Pasadena. Antenna Lab.
ELECTROMAGNETIC THEORY OF DISTRIBUTED FEEDBACK LASERS IN PERIODIC DIELECTRIC WAVEGUIDES Interim Report
G. A. Evans Sep. 1974 181 p refs
(Grant AF-AFOSR-1935-70; AF Proj. 9768)
(AD-A001840; TR-72; AFOSR-74-1747TR) Avail: NTIS CSCL 20/5

A theory for distributed feedback lasers in transversely bounded structures is developed. The space harmonics approach is used to discuss the general properties of periodic structures. The coupled mode approach is used to develop expressions for the threshold gain, longitudinal mode structure, and electromagnetic field distribution for distributed feedback lasers. Three basic structures are considered for distributed feedback lasers-thin film waveguides, diffusion waveguides, and fiber waveguides. Equations for the amplification of a waveguide mode that extends transversely over both regions with and without gain are derived. Analytical expressions are derived for coupling between modes in periodically perturbed dielectric waveguides. Sinusoidal perturbations of the electric permittivity and of the waveguide boundary are considered. GRA

N75-19674# Aerospace Corp., El Segundo, Calif. Lab. Operations.
HELP: A MODEL FOR EVALUATING THE FEASIBILITY OF USING VARIOUS CHEMICAL REACTION SYSTEMS AS ELECTRONIC LASERS Interim Report
J. M. Herbelin 15 Sep. 1974 44 p refs
(Contract F04701-74-C-0075)
(AD-A002132; TR-0075(5641)-2; SAMSO-TR-74-213) Avail: NTIS CSCL 07/4

An analytical model for estimating the minimum requirements of a chemically pumped electronic laser is developed. From a knowledge of the basic spectroscopic and thermodynamic properties of a particular reaction, the model can quickly classify the system according to the feasibility of generating stimulated emission at different possible wavelengths. Sample calculations of the reactions of barium atoms with nitrous oxide and nitrogen dioxide show that the model is sufficiently sensitive to distinguish between very similar systems and therefore should be useful in providing classification criteria in the search for a chemically pumped electronic laser. GRA

N75-19675# Northrop Corp., Hawthorne, Calif. Research and Technology Center.
SPECTRAL LINE SELECTION OF CARBON MONOXIDE LASERS
D. K. Rice Sep. 1974 21 p refs
(Contract N00014-72-C-0043; ARPA Order 1806)
(AD-A002210; NRTC-74-44R) Avail: NTIS CSCL 20/5

An intracavity water vapor cell was used to perform spectral line selection of carbon monoxide lasers. The technique was demonstrated with a low pressure longitudinal discharge laser operating in the CW and repetitive Q-switched modes and with an electron beam stabilized pulsed laser. The cell containing an appropriate amount of water vapor limited laser action in a vibrational band to those rotational lines having predicted high atmospheric transmittance. GRA

N75-19676# Northrop Corp., Hawthorne, Calif.
SCALING OF PARAMETERS AND RESONANCE SELF-ABSORPTION IN CO LASERS
W. B. Lacina and G. L. McAllister Sep. 1974 30 p refs
(Contract N00014-72-C-0043; ARPA Order 1806)
(AD-A002209; NRTC-74-48R) Avail: NTIS CSCL 20/5

High optical extraction efficiencies for CO electric discharge lasers have been theoretically predicted and experimentally demonstrated. Considerable interest for military applications has resulted in programs for development of both pulsed and CW CO EDL's with high power and high energy objectives. In order to make realistic performance predictions for potential device design, it is necessary to understand how these devices scale in volume, pressure, and other parameters. In this report, several generalizations that result from parametric scaling of the CO laser kinetics are reported and compared with experimental data from an e(-)-beam stabilized device. Scaling to high energy and high power systems is discussed. The limitations on high pressure or line-selected operation that may be imposed by resonant self-absorption in the CO medium is discussed. Preliminary investigations suggest that this effect may be an important pressure-dependent mechanism, with possible consequences for attainment of line selection objectives. GRA

N75-19677# Naval Research Lab., Washington, D.C.
ANALYSES OF X-RAY LASER APPROACHES: 2: QUASI-STATIONARY INVERSION ON K-ALPHA INNERSHELL TRANSITIONS
R. C. Elton Oct. 1974 29 p refs
(RR011741)
(AD-A002193; NRL-MR-2906) Avail: NTIS CSCL 20/5

In search for an X-ray laser scheme capable of operating in a quasi-CW mode, a suggested K alpha-innershell scheme is reexamined using recently calculated rates. This scheme involves the decay of a K-shell vacancy followed by a more rapid (for certain elements) L-vacancy decay, which maintains the inversion. The present analysis indicates that the scheme is only marginally feasible unless a depletion of resonant absorbers is accomplished through line shifts associated with multiple ionization following K-vacancy production. The need for a more complete numerical model is indicated. The pumping requirements for overcoming photoionization losses in the beam and the associated gain conditions are estimated for three elements, namely silicon, calcium and copper, and it is concluded that photoionization pumping in a selective energy band is required, with emission approaching the blackbody level. A multiline heavy-ion plasma source is suggested. GRA

N75-19678# Northrop Corp., Hawthorne, Calif. Research and Technology Center.
HIGH POWER CO LASER
V. G. Dragoo, W. B. Lacina, and G. L. McAllister Nov. 1974 44 p refs
(Contract N00014-72-C-0043; ARPA Order 1806)
(AD-A002223; NRTC-74-56R) Avail: NTIS CSCL 20/5

Effort on the High Power CO Laser Program is reviewed. The program is directed toward the development of the required CO laser technology, the required component technology, and the design and construction of intermediate power laser devices. The results of analytical and experimental investigation of the basic characteristics of the laser and data from a high pressure electrically excited CO laser device are discussed. GRA

N75-19679# Lincoln Lab., Mass. Inst. of Tech., Lexington.
OPTICS RESEARCH, 1974-1 Semiannual Report, 1 Jan. - 30 Jun. 1974
Robert H. Rediker 30 Jun. 1974 53 p refs
(Contract F19628-73-C-0002; ARPA Order 600)
(AD-A001971; ESD-TR-74-235) Avail: NTIS CSCL 20/5

Contents: Laser technology and propagation--Pulse propagation, effects, and devices; Optical measurements and instrumentation--Interferometric image evaluation, and long-path monitoring

of atmospheric carbon monoxide by a tunable diode laser system. GRA

N75-19680# Bell Aerosystems Co., Buffalo, N.Y.
PARAMETRIC ANALYSIS OF A DF-CO2 TRANSFER LASER Final Report, Sep. 1973 - Aug. 1974
C. J. Schorr and T. E. Furner Oct. 1974 75 p refs
(Contract N00014-74-C-0019; NR Proj. 000-173)
(AD-A002275; BAC-9224-920001) Avail: NTIS CSCL 20/5

Computations were made using nozzle design computer programs and general kinetics codes to model the NRL transfer chemical laser, and to suggest design changes that would yield higher output power. The effect of deactivators such as HF, N2, and H2O, and different CO2 concentrations on laser performance was evaluated. The major conclusions of this study are that additional F2 in the NRL system will increase the performance, and the water present in the system, while required for GDL operation, is detrimental. In the NRL system D2 was injected upstream of the throat of a 24 nozzle bank. This study indicated that laser performance should improve if the D2 were injected in the optical cavity at the primary nozzle exit. To study this, a nozzle bank of 50 dual slit nozzles was designed. GRA

N75-19681# Air Force Avionics Lab., Wright-Patterson AFB, Ohio.
A REVIEW OF PARAMETRIC OSCILLATORS AND MIXERS AND AN EVALUATION OF MATERIALS FOR 2-6 MICROMETER APPLICATIONS
Eugene R. Nichols, John C. Corbin, Jr., and Vincent L. Donlan Jul. 1974 119 p refs
(AF Proj. 2001)
(AD-A002586; AFAL-TR-74-161) Avail: NTIS CSCL 20/6

A tunable source of narrow line radiation in the 2-6 micrometer band and, to a lesser extent, the 8-12 micrometer band would be useful in several military applications. Only recently have nonlinear optical materials become available to permit construction of optical parametric oscillators (OPO's) and mixers operating at these wavelengths. In this report, a review of the progress in wavelength coverage and output of OPO's and mixers is given, the theoretical performance of eleven nonlinear materials is discussed in detail, and as an example, the materials are compared for use in operating a singly resonant OPO in the 3-6 micrometer band. For this application, the outstanding materials are HgS pumped at 1.06 micrometers and ZnGeP2 pumped at 2.1 micrometers. Other material performances discussed are Ag3AsS3 (Proustite), AgGaS2, AgGaSe2, Ag3SbS3, CdGeAs2, CdSe, LiIO3, LiNbO3 and Tl3AsSe3. Refractive index data on the nonlinear materials and details of the FORTRAN computer program used in the calculations are included. GRA

N75-19682# Army Electronics Command, Fort Monmouth, N.J.
CO2 TEA LASER REPEATER
G. R. Osche, C. Bickhart, and H. Hieslmair Nov. 1974 26 p refs
(DA Proj. 1S1-62102-A-042)
(AD-A002561; ECOM-4277) Avail: NTIS CSCL 20/5

A breadboard model carbon-dioxide (CO22), transversely-excited atmospheric (TEA) laser repeater system, designed for countermeasure applications, has been built and tested. Turn-around times (receive-transmit) on the order of two microseconds have been achieved with this system. Those components significantly contributing to the overall turn-around time are identified and discussed. GRA

N75-20205 Joint Publications Research Service, Arlington, Va.
LASER DEFLECTORS FOR HOLOGRAPHIC MEMORIES BEING DEVELOPED
In its Transl. on Eastern Europe: Sci. Affairs, No. 454 (JPRS-64093) 12 Feb. 1975 p 12-13 Transl. into ENGLISH from Muszaki Elet (Budapest), 3 Jan. 1975 p 2 (For availability see N75-20204 11-99)

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N75-19683* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
GRAIN REFINEMENT CONTROL IN TIG ARC WELDING Patent
William F. Iceland (N. Am. Rockwell Corp., Downey, Calif.) and Edwin L. Whiffen, inventors (to NASA) (N. Am. Rockwell Corp., Downey, Calif.) Issued 4 Feb. 1975 5 p Filed 13 Nov. 1973 Supersedes N74-32925 (12 - 22, p 2701) Sponsored by NASA
(NASA-Case-MSC-19095-1; US-Patent-3,864,542; US-Patent-Appl-SN-415486; US-Patent-Class-219-137) Avail: US Patent Office CSCL 13H

A method for controlling grain size and weld puddle agitation in a tungsten electrode inert gas welding system to produce fine, even grain size and distribution is disclosed. In the method the frequency of dc welding voltage pulses supplied to the welding electrode is varied over a preselected frequency range and the arc gas voltage is monitored. At some frequency in the preselected range the arc gas voltage will pass through a maximum. By maintaining the operating frequency of the system at this value, maximum weld puddle agitation and fine grain structure are produced. Official Gazette of the U.S. Patent Office

N75-19684* National Aeronautics and Space Administration. Pasadena Office, Calif.
MULTITARGET SEQUENTIAL SPUTTERING APPARATUS Patent
Rindge Shima, inventor (to NASA) (JPL) Issued 4 Feb. 1975 8 p Filed 22 Apr. 1974 Supersedes N74-25971 (12 - 15, p 1794) Sponsored by NASA
(NASA-Case-NPO-13345-1; US-Patent-3,864,239; US-Patent-APPL-SN-462705; US-Patent-Class-204-298; US-Patent-Class-204-192) Avail: US Patent Office CSCL 13H

The development and characteristics of a sputtering apparatus are discussed. A potential difference is applied between the cathode and anode to produce a plasma for each target which is sputtered by accelerated ions within the plasma. The process of sputtering for various materials is described. Diagrams of the unit are provided. P.N.F.

N75-19685* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
LATCHING DEVICE Patent
George W. Ulrich, inventor (to NASA) (McDonnell-Douglas Corp., Huntington Beach, Calif.) Issued 4 Mar. 1975 6 p Filed 2 May 1973 Supersedes N73-22417 (11 - 13, p 1532) Sponsored by NASA
(NASA-Case-MFS-21606-1; US-Patent-3,869,160; US-Patent-Appl-SN-356555; US-Patent-Class-292-108; US-Patent-Class-292-122; US-Patent-Class-292-DIG.14) Avail: US Patent Office CSCL 15E

A latching device is suited for use in establishing a substantially motionless connection between a stationary receiver and a movable latching mechanism. The latching mechanism includes a pivotally supported restraining hook continuously urged into a capturing relationship with the receiver, characterized by a spring-biased pawl having a plurality of aligned teeth. The teeth are seated in the surface of the throat of the hook and positionable into restraining engagement with a rigid restraining shoulder projected from the receiver.
Official Gazette of the U.S. Patent Office

N75-19686* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
INTERNALLY SUPPORTED FLEXIBLE DUCT JOINT Patent
Ralph F. Kuhn, Jr., inventor (to NASA) (Rocketdyne, Canoga Park, Calif.) Issued 4 Mar. 1975 5 p Filed 16 Apr. 1974 Supersedes N74-22145 (12 - 13, p 1561) Sponsored by NASA
(NASA-Case-MFS-19193-1; US-Patent-3,869,151; US-Patent-Appl-SN-461477; US-Patent-Class-285-114;

US-Patent-Class-285-226) Avail: US Patent Office CSCL 13G

An internally supported, flexible duct joint for use in conducting fluids under relatively high pressures in systems where relatively large deflection angles must be accommodated is presented. The joint includes a flexible tubular bellows and an elongated base disposed within the bellows. The base is connected through radiating struts to the bellows near mid-portion and to each of the opposite end portions of the bellows through a pivotal connecting body. A motion-controlling linkage is provided for linking the connecting bodies, whereby angular displacement of the joint is controlled and uniformity in the instantaneous bend radius of the duct is achieved as deflection is imposed.
Official Gazette of the U.S. Patent Office

N75-19687 Polish Academy of Sciences, Warsaw.
OPTIMALIZATION OF A MECHANICAL SYSTEM'S PARAMETERS [PEWIEN PRZYPADEK OPTYMALIZACJI PARAMETROW UKLADU MECHANICZNEGO]
Jerzy Wicher 1974 14 p refs In POLISH
(Rept-47/1974) Avail: Issuing Activity

Dynamic processes of a real mechanical system are described with the help of a mathematical model. The structure of a model was determined by the form of differential motion equations. Stochastic processes, amplitudes, Laplace transformation, and Fourier transformation are also discussed. Transl. by M.J.S.

N75-19688 Cornell Univ., Ithaca, N.Y.
THE WHEEL SHIMMY PROBLEM: ITS RELATIONSHIP TO LONGITUDINAL TIRE FORCES, VEHICLE MOTIONS, AND NORMAL LOAD OSCILLATIONS Ph.D. Thesis
William Alan Podgorski 1974 174 p
Avail: Univ. Microfilms Order No. 74-26302

Shimmy of a pneumatic tire system is discussed. A digital computer model of swiveling fork-tire system is developed. In addition, several analytical studies of simplified models of the system are made. The computer model includes dynamic tire response, braking-traction forces, and vehicle accelerations. The computer model also incorporates wheel unbalance, radial wheel runout, axial wheel runout, and road roughness. Both the computer simulations and the analytical studies show that braking or traction forces affect the stability of the system slightly. A braking force stabilizes the system by decreasing the range of velocities over which the shimmy is unstable. A traction force destabilizes the system. The computer simulations show that the effect of vehicle accelerations on system stability is small. Dissert. Abstr.

N75-19689# National Research Council of Canada, Ottawa (Ontario).
THE MEASUREMENT OF RADIATION FROM ARC WELDING CARRIED OUT BY MEANS OF VARIOUS WELDING PROCESSES (INCLUDING PLASMA CUTTING). A CONTRIBUTION TOWARDS THE REVISION OF GERMAN INDUSTRIAL STANDARD DIN 4647 SHEET 1: THE USE OF OPTICAL GLASS IN EYE-PROTECTION EQUIPMENT; PROTECTIVE FILTER GLASS FOR WELDING
H. J. Huebner, E. Krause, J. Ruge, and E. Sutter 1974 12 p Transl. into ENGLISH from Schweissen Schneiden (Duesseldorf), v. 24, no. 8, 1972 p 290-293
(NRC-TT-1779) Avail: NTIS HC $3.25

Measurements of radiation from various arc welding processes and from plasma cutting were carried out to determine the necessary eye-protection equipment. The corresponding protective filter shade is indicated as a function of the current. Author

N75-19690*# California State Univ., Northridge. School of Engineering.
APPLICATION OF EXPERIMENTAL STRESS ANALYSIS TECHNIQUES TO SPEED BALL BEARINGS Final Technical Report
Lester J. Nypan 28 Feb. 1975 4 p refs
(Grant NGR-05-062-002)
(NASA-CR-136757) Avail: NTIS HC $3.25 CSCL 13I

The object of the project was to determine experimentally the stress distribution in cylindrically hollow and spherically hollow balls. Ball models several times actual bearing ball size were fabricated. Strain gage rosettes will be mounted on the outside and inside surfaces of the models at specific locations and orientations. The models were subjected to a range of static loads simulating actual ball-race contact loads experienced in high-speed bearings operating at DN values from 2 to 4 million. The strain gages were read, and the principal strains determined for each load setting. Principal stresses were calculated and dimensionless stress coefficients determined to permit the evaluation of stresses in hollow balls of any size and load of geometrically similar configuration. Author

N75-19691*# Fairchild Stratos Corp., Manhattan Beach, Calif.
LONG LIFE VALVE DESIGN CONCEPTS Final Report
J. R. Jones and Archer H. Hall, Jr. 10 Mar. 1975 307 p refs
(Contract NAS8-28518)
(NASA-CR-120704; ER-966-25) Avail: NTIS HC $9.25 CSCL 13I

Valve concept evaluation, final candidate selection, design, manufacture, and demonstration testing of a pneumatically actuated 10-inch hybrid poppet butterfly shutoff valve are presented. Conclusions and recommendations regarding those valve characteristics and features which would serve to guide in the formulation of future valve procurements are discussed. The pertinent design goals were temperature range of plus 200 to minus 423 F, valve inlet pressure 35 psia, actuation pressure 750 psia, main seal leakage 3 x 0.00001 sccs at 35 psia valve inlet pressure, and a storage and operating life of 10 years. The valve was designed to be compatible with RP-1, propane, LH2, LO2, He, and N2. Author

N75-19692*# National Aeronautics and Space Administration, Washington, D.C.
CABLES AND CONNECTORS: A COMPILATION Technology Utilization
Sep. 1974 34 p
(NASA-SP-5936(03)) Avail: NTIS HC $1.00 CSCL 13E

A technological compilation on devices and techniques for various types of electrical cables and connections is presented. Data are reported under three sections: flat conductor cable technology, newly developed electrical connectors, and miscellaneous articles and information on cables and connector techniques. Author

N75-19693# Joint Publications Research Service, Arlington, Va.
WELDING IN INERT AND ACTIVE GASES
A. G. Potapyevskiy 24 Mar. 1975 122 p Transl. into ENGLISH from Svarka v Zashchitn. Gazakh Plavyashchimsya Elektrodom (Moscow), 1974 p 52-116
(JPRS-64384) Avail: NTIS HC $5.25

Inert and active gases, their properties, welding in argon, helium, and nitrogen, and welding technology are discussed. Other topics discussed include welding of nonferrous metals, welding with high alloy steels and alloys, thermal and metallurgical characteristics of welding with active gases, welding modes and techniques, welding joints, spot welding, and welding of cast iron. M.J.S.

N75-19694# Joint Publications Research Service, Arlington, Va.
BENEFITS OF THE INTRODUCTION OF TYPE DESIGNS IN AUTOMATIC CONTROL SYSTEMS
V. Bakhirev and V. Glushkov 11 Mar. 1975 13 p Transl. into ENGLISH from Sotsialisticheskaya Industr. (Moscow), 26 Dec. 1974 p 2
(JPRS-64295) Avail: NTIS HC $3.25

The benefits of introducing automated control systems in the machine building industry are discussed. Other topics discussed include a common mathematical language, an information data bank, and design criteria. Author

N75-19695# Royal Aircraft Establishment, Farnborough (England).
THE OCCURRENCE OF ANOMALOUSLY LOW FRICTION DURING ELECTRON BOMBARDMENT OF A SLIDING MOLYBDENUM DISULPHIDE SURFACE
E. A. Dukhovskoi, A. N. Ponomarev, A. A. Silin, and V. L. Tal'roze Dec. 1974 10 p refs Transl. into ENGLISH from Zh. Eksp. Teor. Fiz. (USSR), v. 4, no. 20, 1974 p 268-272

(RAE-Lib-Trans-1829; BR46403) Avail: NTIS HC $3.25

Experimental data are given describing the occurrence of anomalously low friction when a sliding surface of molybdenum disulphide is irradiated with electrons. The mechanism and similarity of the effects are indicated when molybdenum disulphide is bombarded either by electrons or accelerated helium atoms.

Author

N75-19696# Laboratorio de Acustica e Sonica, Sao Paulo (Brazil).

MEASUREMENT OF ACCELERATION AND VELOCITY IN PARSONS-PEEBLES TURBINE-GENERATOR SET, WITH OCTAVE BAND SPECTRA

L. X. Nepomuceno 28 Oct. 1974 50 p In PORTUGUESE and ENGLISH

(Rept-7410.733) Avail: NTIS HC $3.75

A schematic description is given of the values of acceleration and velocity in different spots in a turbine-generator set. A description is also given of equipment, accessories, and measuring method. Results are given in numerical and graphical values for the running of the complete set, for the generator uncoupled, and for the turbine running free.

Author

N75-19697*# Northwestern Univ., Evanston, Ill.

DYNAMIC RESPONSE AND STABILITY OF A GAS-LUBRICATED RAYLEIGH-STEP PAD

Chi Cheng and H. S. Cheng Mar. 1973 141 p refs

(Grant NGL-14-007-093)

(NASA-CR-121156) Avail: NTIS HC $5.75 CSCL 13I

The quasi-static, pressure characteristics of a gas-lubricated thrust bearing with shrouded, Rayleigh-step pads are determined for a time-varying film thickness. The axial response of the thrust bearing to an axial forcing function or an axial rotor disturbance is investigated by treating the gas film as a spring having nonlinear restoring and damping forces. These forces are related to the film thickness by a power relation. The nonlinear equation of motion in the axial mode is solved by the Ritz-Galerkin method as well as the direct, numerical integration. Results of the nonlinear response by both methods are compared with the response based on the linearized equation. Further, the gas-film instability of an infinitely wide Rayleigh step thrust pad is determined by solving the transient Reynolds equation coupled with the equation of the motion of the pad. Results show that the Rayleigh-step geometry is very stable for bearing number A up to 50. The stability threshold is shown to exist only for ultrahigh values of Lambda equal to or greater than 100, where the stability can be achieved by making the mass heavier than the critical mass.

Author

N75-19698# Oak Ridge Y-12 Plant, Tenn.

MINICOMPUTER CONTROL SYSTEM FOR AN ULTRAPRECISION TURNING MACHINE

R. R. Burleson 11 Nov. 1974 51 p refs

(Contract W-7405-eng-26)

(Y-1951) Avail: NTIS HC $4.25

An ultraprecision machining capability is needed to meet the requirements for aspherical, optical-quality surfaces for the laser-fusion program. A minicomputer based control system was developed for use on a Moore Number 3 measuring machine which was transformed into a very accurate contouring machine tool. A 15-inch-diameter by 2-inch-thick copper-plated aluminum disc was machined to a 600-inch-radius spherical contour to determine the viability of the system. The surface finish was 50 nm, peak to valley, with a contour error of less than 2500 nm.

Author (NSA)

N75-19699# Sandia Labs., Albuquerque, N.Mex.

TRANSPORT OF OXYGEN IN AMORPHOUS Ge THIN FILMS DURING ANNEALING

M. L. Knotek 1974 24 p refs Presented at the 21st Natl. Symp. of the Am. Vacuum Soc., Anaheim, Calif., 19 Oct. 1974 Sponsored by AEC

(SLA-74-5160; Conf-741015-4) Avail: NTIS HC $3.25

Both direct and indirect evidence has suggested that low-density a-Ge films grown at substrate temperatures less than 100 C are porous or void-filled, and that high-density films grown at substrate temperature greater than 150 C are free of such voids. This evidence includes the results of electron microscopy, where the presence or absence of such voids was directly detected, and the effects of annealing on the dc electrical transport properties where the sensitivity to small quantities of gas present during annealing suggested a porous nature for low substrate temperature films. Using Auger electron spectroscopy in conjunction with ion sputter etching, it was determined directly that the structure of these films is such as to promote rapid movement of oxygen through the films, suggesting a porous nature. The results suggest that the discrepancies in optical and electrical properties reported in the literature for annealed a-Ge are due to oxygen contamination.

Author (NSA)

N75-19700# Sandia Labs., Albuquerque, N.Mex.

IMPACT TESTING USING A VARIABLE ANGLE ROCKET LAUNCHER

H. W. Nunez [1974] 7 p Presented at the 45th Shock and Vibration Symp., Dayton, Ohio, 22 Oct. 1974 Sponsored by AEC

(SAND-74-5041; Conf-741006-1) Avail: NTIS HC $3.25

A test facility that uses a rocket-powered sled to launch a test item at an impact target is described. The rail along which the sled is launched is capable of being elevated so that the relative angle between the line of flight and the impact target face can be varied between 90 deg and near 0 deg. A 2000-pound test unit can be accelerated to an impact velocity of approximately 200 feet per second.

Author (NSA)

N75-19701# British Steel Corp., London (England). Information Services.

THE FORMULATION AND PROPERTIES OF SUBMERGED-ARC WELDING FLUXES. PART 1: MANUFACTURE AND QUALITY CONTROL PART 2: PHYSICAL PROPERTIES AND WELDABILITY

J. G. Garland and N. Bailey Oct. 1974 20 p refs

(PB-238170/5; GS/PROD/498/1/74/C) Avail: NTIS HC $3.25 CSCL 13H

The basic requirements for submerged-arc-welding fluxes are identified, together with the difficulties associated with soundly based welding consumable selection in the light of the current proliferati of empirically developed commercial flux formulations. Manufacturing techniques for welding fluxes are reviewed and present quality control measures assessed. The need for considerable improvement in this area as the use of submerged arc welding in critical applications increases is emphasized and a more comprehensive unified approach to flux quality control is outlined. A number of physical properties of submerged arc welding fluxes known to be critical with respect to flux performance where possible limits necessary to ensure good weldability and are considered satisfactory weld metal properties are defined.

GRA

N75-19702# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

WELDING STRUCTURAL MEDIUM CARBON, LOW ALLOY STEELS OF INCREASED AND HIGH STRENGTH. CHAPTER 3

M. V. Poplavko-Mikhailov and K. G. Nikiforova 31 Oct. 1974 71 p refs Transl. into ENGLISH from Spravochnik Svarke (USSR), v. 4, 1971 p 46-84

(FTD Proj. T74-01-10)

(AD-A001848; FTD-MT-24-774-74) Avail: NTIS CSCL 13/8

The chapter discusses methods of calculating welding regimes for metals. The engineering and technology of welding different steels, irons, nonferrous, low-melting metals, metals of different types, and the welding of plastics are discussed along with methods of reestablishing the dimensions of machine parts.

GRA

N75-19703# Abex Corp., Mahwah, N.J. Research Center.

MACHINE CASTING OF FERROUS ALLOYS Interim Report, 1 Feb. - 30 Jun. 1974

H. R. Larson, B. A. Heyer, and C. P. Biswas Sep. 1974 40 p refs

(Contract DAAG46-73-C-0113)

(AD-A000913; AMMRC-CTR-74-56) Avail: NTIS CSCL 13/8

A completely integrated furnace-valve-mold ferrous casting system was developed that will produce quality castings in the five to twenty-five pound class at a higher speed and lower cost than is possible by present casting methods. Efforts have

been directed in three major areas: design and fabrication of an experimental melting and casting unit capable of examining several casting process possibilities; determination of the feasibility of a magnetohydrodynamic valve using laboratory scale equipment and, development of a mold coating for graphic or some other suitable mold material that will provide the properties required of a permanent mold in the automatic casting process envisioned. GRA

N75-19704# Naval Research Lab., Washington, D.C.
TENSILE AND TORSIONAL CHARACTERISTICS OF ELECTROMECHANICAL CABLES Final Report
Roy K. Samras Nov. 1974 62 p refs
(NRL Proj. 84F02-34; NRL Proj. PO-3-0031)
(AD-A002198; NRL-MR-2943) Avail: NTIS CSCL 13/9

The tensile and torsional properties of five electromechanical cables and one wire rope commonly used in oceanographic work were tested statically in a tensile testing machine. Testing procedures and apparatus, developed previously at NRL, are briefly described. Tension, torque and elongation were recorded simultaneously during each test. GRA

N75-19705# Army Foreign Science and Technology Center, Charlottesville, Va.
IMPROVING THE OIL STORAGE SYSTEM OF WESTERN SIBERIA
N. M. Olenev and G. A. Khoirysh 31 Oct. 1973 9 p refs Transl. into ENGLISH from Transp. Khranenie Nefti Nefteprod. (USSR), No. 2, 1972 p 13-17
(AD-A002717; FSTC-HT-23-1473-73) Avail: NTIS CSCL 13/4

Conventional oil storage tanks are unsuitable for the conditions of western Siberia due to their high construction and maintenance costs, soil and wind conditions and losses of light oil fractions caused by cyclical temperature variations. These problems have been largely overcome in an oil storage system developed at the Tyumen Industrial Institute. It consists of bottomless cylindrical tanks, immersed in a water medium. The tanks are filled with oil from the top, displacing the water. The water provides large safety margins, allows for construction in swampy or inundated areas and serves to insulate the oil against subzero temperatures. GRA

N75-19706# Mechanical Technology, Inc., Latham, N.Y.
ON THE HEAVILY LOADED ELASTOHYDRODYNAMIC CONTACTS OF LAYERED SOLIDS Final Report
Pradeep K. Gupta Dec. 1974 36 p refs
(Contract N00014-72-C-0083; NR Proj. 062-317)
(AD-A002432; MTI-75TR10) Avail: NTIS CSCL 11/8

An inlet zone analysis is presented for the elastohydrodynamic lubrication of heavily loaded contacts of layered elastic solids under isothermal and isoviscous conditions. An elastic layer of incompressible elastomeric material (with Poisson's ratio = 0.50) bonded to a rigid substrate is considered. Numerical results are presented in dimensionless form to describe the variation of nominal film thickness over a wide range of loads, layer thicknesses and other operating variables. GRA

N75-19707# Army Foreign Science and Technology Center, Charlottesville, Va.
TECHNICAL MEANS THAT ENSURE HIGH PHYSICAL AND MECHANICAL PROPERTIES OF MACHINE PARTS
I. S. Silaev, A. G. Bratukhin, and V. M. Grigorev 10 Aug. 1974 12 p Transl. into ENGLISH from Standarty i Kachestvo (USSR), no. 5, 1972 p 57-60
(AD-A002650; FSTC-HT-23-0396-74) Avail: NTIS CSCL 13/8

The production methods used in fabricating machine parts from steels and alloys are generally discussed with emphasis given to the problems associated with precision large scale casting. Solutions to some of these problems are noted where vitreous enamels, contour casting, etc. have been successfully employed with medium and high strength steels and alloys. GRA

N75-19286* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SKYLAB EXPERIMENTS ON METALS
C. A. Lundquist *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 1-10 refs (For availability see N75-19285 11-12)

N75-19315 Battelle Inst., Frankfurt am Main (West Germany).
ULTRASONIC POSITIONING AND STIRRING
E. G. Lierke *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 303-310 refs (For availability see N75-19285 11-12)

N75-19316 Tocco-Stel, Massy (France).
USE OF ELECTROMAGNETIC FIELDS FOR POSITIONING AND STIRRING MATERIALS UNDER ZERO GRAVITY
J. Reboux *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 311-326 refs (For availability see N75-19285 11-12)

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N75-19708# Laboratorio de Acustica e Sonica, Sao Paulo (Brazil).
ULTRANSONIC INSPECTION OF CAST STEEL PIECES PRIOR TO MACHINING
L. X. Nepomuceno and M. F. Barbosa 19 Dec. 1974 11 p In PORTUGUESE; ENGLISH summary
(Rept-7412.753) Avail: NTIS HC $3.25

The inspected parts, equipment, and accessories are described along with the observed results. Results are presented in schematics showing the defect positions. Photos of the observed echograms are included. F.O.S.

N75-19709# Laboratorio de Acustica e Sonica, Sao Paulo (Brazil).
ULTRASONIC INSPECTION AND EXAMINATION OF STEEL SHEETS AND PLATES THAT WERE USED IN THE PRODUCTION OF SPHERICAL SECTORS
L. X. Nepomuceno and M. F. Barbosa 12 Dec. 1974 19 p In PORTUGUESE; ENGLISH summary
(Rept-7412.749) Avail: NTIS HC $3.25

The equipment and procedures are described used in the ultrasonic examination and inspection of a spherical sector made from steel plates. The results are presented in a schematic indicating the defect position. Author

N75-19710# Laboratorio de Acustica e Sonica, Sao Paulo (Brazil).
ULTRASONIC EXAMINATION AND INSPECTION OF HIGH QUALITY STEEL PLATES, ACCORDING TO ASTM A-435/67
L. X. Nepomuceno and M. F. Barbosa 19 Dec. 1974 20 p In PORTUGUESE; ENGLISH summary
(Rept-7412.754) Avail: NTIS HC $3.25

The results of the ultrasonic inspection of 17 plates are presented in schematics indicating the defect positions. Author

N75-19711# Laboratorio de Acustica e Sonica, Sao Paulo (Brazil).
ULTRASONIC INSPECTION AND EXAMINATION OF HIGH QUALITY STEEL PLATES
L. X. Nepomuceno and E. S. Castillo Barrios 28 Dec. 1974 12 p In PORTUGUESE; ENGLISH summary
(Rept-7412.756) Avail: NTIS HC $3.25

The results are given for the ultrasonic inspection of a set of high quality steel plates. The results are presented in schematics with defect positioning. Author

N75-19712# Laboratorio de Acustica e Sonica, Sao Paulo (Brazil).
INSPECTION OF THE WELDMENTS AND HEADS IN ZEPHYR 2 PLATFORM OPERATED BY BRASBRIL
L. X. Nepomuceno and E. S. Castillo Barrios 17 Jan. 1975 40 p
(Rept-7501.757) Avail: NTIS HC $3.75

The results of the ultrasonic inspection of weldments and dye check inspection of heads are presented in schematics, indicating the inspected regions and/or spots, with defect positioning. Author

N75-19713# Laboratorio de Acustica e Sonica, Sao Paulo (Brazil).
CORROSION CONTROL OF CHEMICAL EQUIPMENT THROUGH THICKNESS MEASUREMENTS BY PULSED ULTRASONICS
L. X. Nepomuceno 9 Jan. 1975 12 p In PORTUGUESE; ENGLISH summary
(Rept-7501.759) Avail: NTIS HC $3.25

The results are reported of ultrasonic inspection of installed equipment for an industrial chemical plant. The thickness at each point of measurement is indicated. Author

N75-19714# Danish Research Center for Applied Electronics, Hoersholm.
RELIABILITY ANALYSIS ON ELECTRONIC CIRCUITS. PRACTICAL APPLICATION OF RELIABILITY PREDICTIONS WITH APPLICATION OF FAILURE MODE ANALYSIS AND FAULT TREE ANALYSIS [PALIDLIGHEDSANALYSE AF ELEKTRONISKE KREDSLOB. PRAKISK BRUG AF PALIDELIGHEDSFORUDSIGELSE SAMT BRUG AF FEJLEFFEKTANALYSE OG FEJLTRAEANALYSE]
Anders Hogsholm Nov. 1974 61 p refs In DANISH; ENGLISH summary
(ECR-46) Avail: NTIS HC $4.25

Two phases in the design of a reliable electronic circuit are treated. In the first phase the aim is to estimate the circuit reliability and if the latter is not sufficient, advise how the reliability can be improved. The circuit reliability is computed using parts count technique and reliability block diagrams. In second, the phase, the effects of component failures that will occur are investigated. In applying failure mode effect analysis and fault tree analysis the critical failures are found. Some general rules for avoiding critical failures are presented and examples showing the use of these are given. Author

N75-19715# Science Research Council, Chilton (England). Rutherford Lab.
METHOD OF TESTING MULTIWIRE PROPORTIONAL CHAMBERS BY GLOW DISCHARGE/PHOTOGRAPHIC TECHNIQUES
J. B. Marsh, J. E. Boon, K. H. Souten, and B. OHagan May 1974 14 p refs
(RL-74-080) Avail: ERDA Depository Libraries HC $4.00

It is stated that a method of testing was evolved principally to identify faults, quickly and positively, on large chambers at the end of their manufacture. Dry nitrogen of high purity was found to have advantages over an air discharge. Photographs were taken, and examples are shown of typical faults and of the effect of cleaning the wires. Interplane accuracy is also discussed. The performance was checked by exposing the chamber to a 2 mC source of ruthenium-103 at grid reference points and noting the change in overall chamber current at each point. NSA

N75-19716# Commission of the European Communities, Brussels (Belgium).
WELD SEAM TESTING IN THE CONSTRUCTION OF LONG PIPELINES WITH THE SELF-PROPELLING ISOTOPE CRAWLER
K. Sauerwein Mar. 1974 25 p refs In GEORGIAN
(EURISOTOP-79) Avail: ERDA Depository Libraries HC $4.25

Pipelines under construction require continuous radiographic testing of girth welded seams as building progresses. Since conventional, manually-operated radiographic equipment is not suitable for this purpose, new self-propelled testing equipment had to be designed which would function without any external energy source and would be able to crawl inside the pipes while being controlled from outside. These requirements led to the development of isotope crawlers for radiographic testing. A crawler is described that complies with the requirements. Details are given of the technical design of the crawler, which is a fourwheeled vehicle with a built-in motor and controls. It also describes how the testing apparatus with its incorporated Ir-192 gamma-ray source works, and gives details concerning the built-in or built-on electric battery equipment. The mode of operation of the crawler is explained together with its external control system, which is actuated by a pilot emitter. Author (NSA)

N75-19717# Sprague Electric Co., North Adams, Mass.
PRODUCTION ENGINEERING MEASURE FOR IMPROVED RELIABILITY OF METALLIZED POLYCARBONATE AND METALLIZED POLYSULFONE CAPACITORS Quarterly Report, 1 May - 31 Jul. 1974
Leonard Adelson Aug. 1974 24 p refs
(Contract DAAB05-67-C-2707)
(AD-A001816; QR-28) Avail: NTIS CSCL 09/1

The 11,550 Polysulfone Capacitors of the First Production Run continued on the 10,000 hour Extended Life Test at +125C and at rated voltage in accordance with Specification MIL-C-39022, paragraph 4.6.18.3.1. The elapsed times to date are 8,942, 8,562 and 8,284 hours for capacitors in ovens 1, 2 and 3 respectively. The 8000 hour sample check of 300 capacitors is discussed. GRA

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N75-19718 + Engineering Sciences Data Unit, London (England).
FLEXIBILITIES OF AND STRESSES IN UNRESTRAINED PRESSURISED THIN PIPE BENDS SUBJECTED TO IN-PLANE BENDING
Nov. 1974 12 p Sponsored by the Royal Aeronautical Soc. and Inst. of Mech. Engr.
(ESDU-74043) Avail: NTIS HC $50.50

Strength analysis of bends in pneumatic, hydraulic, and chemical plant piping systems are investigated to provide the stress and flexibility analysis of pressurized thin pipe. Graphs show the flexibility and stress factors of the pipes. M.C.F.

N75-19719 Polish Academy of Sciences, Warsaw.
AN ENERGY METHOD FOR ANALYZING THE INFLUENCE OF FRICTION IN THE PROCESS OF PLASTIC COMPRESSION OF CYLINDRICAL SAMPLES [ENERGETYCZNA METODA ANALIZY WPLYWU TARCIA W PROCESIE PLASTYCZNEGO SCISKANIA PROBKI WALCOWEJ]
Zdzislaw Malinowski 1974 24 p refs In POLISH
(Rept-48/1974) Avail: Issuing Activity

Friction and friction distribution on the surface of cylindrical bodies are discussed along with constant values of tangent stresses. Other topics discussed include plastic deformation, metal working, interface tension, and compression loads.
Transl. by M.J.S.

N75-19720 Purdue Univ., Lafayette, Ind.
ANALYSIS OF MODERATELY THICK FLANGED SHELL OF REVOLUTION Ph.D. Thesis
Divaker Vithalrao Pathak 1974 89 p
Avail: Univ. Microfilms Order No. 74-26759

A hybrid procedure for analysis of moderately thick shells of revolution with flanges is presented. The procedure combines finite element method with a step-by-step integration method. Solid-ring elements are used to model the flange region which consists of the flange and short portions of the shell adjacent to the flange. The short portions of the shell are included in order not to disturb the shell character of the solution at the interfaces. The section of solid-ring element is quadrilateral formed by putting together four triangles. The Goldberg-Bogdanoff numerical integration method is used in the flangeless portion of the shell. In order to handle the flange region as a giant step-by-step numerical integration procedure, an influence coefficient matrix named the transflange matrix is obtained for the flange region. The governing shell equations are derived for orthotropic materials starting with the displacement and stress distributions given by Reissner and Nagdhi and using the Hellinger-Reissner variational theorem. Dissert. Abstr.

N75-19721 Stanford Univ., Calif.
WEAKENING OF ELASTIC SOLIDS BY ARRAYS OF CRACKS Ph.D. Thesis

William Robert Delameter 1974 162 p
Avail: Univ. Microfilms Order No. 74-27006

The stress intensity factors and the effective elastic constants of an infinite body with a doubly-periodic array of parallel slit-like cracks are determined. The material is isotropic (although the response of the body with cracks is anisotropic) and linearly elastic, and the cracks are arranged in one of two patterns: (1) a rectangular array, or (2) a diamond-shaped array. The problems are formulated by representing each crack by suitable continuous distributions of straight dislocations. Singular integral equations for the dislocation distribution functions are obtained by requiring that the crack faces be traction-free, and an approximate numerical method for the solution of these integral equations, which begins with the expansion of the non-singular part of the kernel in a series of Chebyshev polynomials, is presented. Dissert. Abstr.

N75-19722 Stanford Univ., Calif.
THE EFFECT OF DYNAMIC PERTURBATIONS ON THE STATIC STRENGTH OF INITIALLY IMPERFECT AXIALLY COMPRESSED, CIRCULAR CYLINDER SHELLS Ph.D. Thesis
Joseph Mullen, Jr. 1974 119 p
Avail: Univ. Microfilms Order No. 74-27067

The effects of dynamic perturbations on the maximum strength of initially imperfect, axially compressed, circular cylindrical shells are studied using a modified Hamilton's principle based on a Reissner-type functional, von Karman-Donnell shell kinematics, and a deformation theory of plasticity. Only lateral inertia is assumed to contribute to the kinetic energy. Three dynamic conditions are examined for their effects on maximum strength: (1) response to prescribed end-shortening rate, (2) induced vibration at prescribed end-loading, and (3) induced vibration at prescribed end-shortening. Equations of motion obtained from direct application of the variational principle and based on the modal forms of static analysis are solved exactly to obtain the structural response of the shell. Dissert. Abstr.

N75-19723 Northwestern Univ., Evanston, Ill.
PROBLEMS OF ELASTODYNAMIC CRACK PROPAGATION Ph.D. Thesis
Vijayarenga Krishna Varatharajulu 1974 137 p
Avail: Univ. Microfilms Order No. 74-28767

An analytical study of dynamic problems of asymmetrical crack propagation is presented. The problems that are considered are skew crack propagation and crack bifurcation, and propagation of a surface crack under an arbitrary angle with a free surface. Two types of transient problems are considered: (1) an existing crack starts to propagate upon being struck by a transient horizontally polarized stress wave, and (2) a crack is generated at a bounding surface of a body, and propagates under an arbitrary angle with the surface when that surface is subjected to anti-plane mechanical disturbances which give rise to wave motion in the medium. The problems are two-dimensional in character and they involve anti-plane shear motions only. Dissert. Abstr.

N75-19724 Northwestern Univ., Evanston, Ill.
FINITE ELEMENT METHODS IN ELASTICITY Ph.D. Thesis
Kang-nan Lee 1974 98 p
Avail: Univ. Microfilms Order No. 74-28671

General variational principles with several independent continuous or discontinuous fields are used to develop finite element formulations for the analysis of bending, buckling, and free vibration of elastic beams and plates, and for the analysis of linear and nonlinear elasticity problems. In these general variational statements arbitrary piece-wise smooth functions can be used to approximate any field. Thus one may expect a more accurate estimate of any desired field, for example, the stress field, with crude estimates of the accompanying other fields.
Dissert. Abstr.

N75-19725 Northwestern Univ., Evanston, Ill.
STRESS ANALYSES FOR LAYERED MEDIA Ph.D. Thesis
Kasem Chantaramungkorn 1974 97 p
Avail: Univ. Microfilms Order No. 74-28595

Problems in plane elasticity involving the adhesive bonding of elastic layers are discussed. It is assumed that the bond is sufficiently thin such that there is no discontinuity in the displacements between the contacting layers. All problems are formulated to lead to systems of singular integral equations which are solved by a collocation scheme. The problem of a double lap joint is analyzed and solved by using integral transform techniques. By use of appropriate boundary and continuity conditions the problem is reduced to two coupled singular integral equations, whose unknowns are the normal and shear bond stresses. The subsidiary conditions are those of static equilibrium in the bond region. The double lap joint is approximated by considering the bonding of three layers, infinite in extent. Of interest is also the problem of layers which have finite dimensions. Dissert. Abstr.

N75-19726 Northwestern Univ., Evanston, Ill.
AN ANLYTICAL AND EXPERIMENTAL INVESTIGATION OF WAVE-INDUCED STRESSES AT A CIRCULAR INHOMOGENEITY Ph.D. Thesis
Shu-Jin Fang 1974 204 p
Avail: Univ. Microfilms Order No. 74-28617

A study was conducted to determine wave-induced stresses at a circular hole in a structure. The conditions investigated were as follows: (1) the diffraction of a plane compressional stress pulse by a circular hole, (2) scattering of plane compressional pulses by a circular inclusion, and (3) the inital response of Hysol 4485 under explosive loading. Analytical computations were obtained by using the generalized plane-stress assumption and the theory of elasticity. Special attention was directed to the dynamic stress concentration at the boundary of the hole.
Dissert. Abstr.

N75-19727 Colorado State Univ., Fort Collins.
STRESS INTENSITY FACTOR FOR SEMIELLIPTICAL CRACKS Ph.D. Thesis
Donald Roy Sorensen 1974 105 p
Avail: Univ. Microfilms Order No. 74-27966

The three-dimensional equations of elasticity are solved for a flat elliptical crack which has nonuniform shear stresses applied to its surfaces. An alternating method is used to determine the mode two and mode three stress intensity factors for a semielliptical surface crack in the surface of a finite thickness solid. These stress intensity factors are presented as a function of position along the crack border for a number of crack shapes and crack depths. This same technique is followed to determine the mode one stress intensity factors for the semielliptical surface crack which has normal loading applied to its surfaces. Mode one stress intensity factors are presented and compared with the results obtained from previous work. Dissert. Abstr.

N75-19728 Tennessee Univ., Knoxville.
ORTHOTROPIC PHOTOELASTICITY FOR FIBER REINFORCED COMPOSITE MATERIALS Ph.D. Thesis
Charles Eugene Knight, Jr. 1974 143 p
Avail: Univ. Microfilms Order No. 74-27217

A study was made of the development of orthotropic photoelasticity as a viable means of experimentally analyzing the stresses in orthotropic material structures. Theoretical formulation of the governing equations and verification experiments for the theory are investigated. Material with sufficient transparency and uniformity is prepared. The theoretical relationships are derived by utilizing the tensorial nature of stress, strain and birefringence in the material. The relations are condensed to provide the equations needed for plane stress analysis. Experiments are carried out on special biaxial stress fields created in off-axis uniaxial tensile stress specimens. Material properties are determined experimentally and calculated from a microstructure finite element model. The experiments conducted support the theoretical orthotropic photoelasticity formulation. A plane stress problem solution by orthotropic photoelasticity shows good correlation with finite element and elasticity solutions.
Dissert. Abstr.

N75-19729 Florida Univ., Gainesville.
ORTHOTROPIC CYLINDRICAL SHELLS UNDER DYNAMIC LOADING Ph.D. Thesis
Elmer Mangrum, Jr. 1970 171 p
Avail: Univ. Microfilms Order No. 74-27362

An orthotropic right cylindrical shell is analyzed when subjected to a discontinuous, finite length pressure load moving in the axial direction at constant velocity. The analysis utilizes

linear, small deflection shell theory which includes the effect of axial and circumferential prestress, transverse shear deformation, and external radial damping. The problem is solved using Fourier transforms, and the inverse Fourier integrals are evaluated for the radial deflection, axial deflection and rotation by expanding the Characteristic Equation in partial fractions and using complex contour integration. By studying the discriminant of the undamped characteristic equation the load velocities which give repeated roots are determined. The loci of these velocities separate regions in which the form of the displacement solutions differ. The behavior of these load velocity loci is studied for variations in the three nondimensionalized material moduli: the thickness-to-radius ratio, the axial prestress, and the circumferential prestress. Dissert. Abstr.

N75-19730 Northwestern Univ., Evanston, Ill.
MECHANICAL PROPERTIES OF Ni-Ti COMPOSITE STRUCTURES Ph.D. Thesis
Predrag Golumbovski 1974 134 p
Avail: Univ. Microfilms Order No. 74-28627

Mechanical properties of directionally solidified eutectics in the ternery systems Ni-Ti-Cr and Ni-Ti-V were investigated. These systems form pseudo-binary eutectics consisting of Ni-based solid solution and the intermetallic compound Ni3Ti. The alloys with various composition were directionally solidified and structurally characterized by means of the transmission and scanning electron microscopy. Special attention was given to the influence of composition and growth rate on the lamellar characteristics of the structures, as well as to the crystallographic relation between the two phases. Mechanical testing, tensile and stress relaxation tests, were carried out at high temperatures (between 600 C and 900 C). Data from those tests were used to calculate various quantities and parameters such as the strength coefficient, the strain hardening exponent, dislocation velocity exponent, internal and effective stress, strain-rate sensitivity exponent, activation volume, activation enthalpy, etc. Dissert. Abstr.

N75-19731*# Martin Marietta Corp., Denver, Colo.
DESIGN, FABRICATION AND TEST OF LIGHTWEIGHT SHELL STRUCTURE Final Report
John R. Lager Feb. 1975 155 p refs
(Contract NAS8-29979)
(NASA-CR-120605; MCR-75-10) Avail: NTIS HC $6.25 CSCL 20K

A cylindrical shell structure 3.66 m (144 in.) high by 4.57 m (180 in.) diameter was designed using a wide variety of materials and structural concepts to withstand design ultimate combined loading 1225.8 N/cm (700 lb/in.) axial compression and 245.2 N/cm (140 lb/in.) torsion. The overall cylinder geometry and design loading are representative of that expected on a high performance space tug vehicle. The relatively low design load level results in designs that use thin gage metals and fibrous-composite laminates. Fabrication and structural tests of small panels and components representative of many of the candidate designs served to demonstrate proposed fabrication techniques and to verify design and analysis methods. Three of the designs evaluated, honeycomb sandwich with aluminum faceskins, honeycomb sandwich with graphite/epoxy faceskins, and aluminum truss with fiber-glass meteoroid protection layers, were selected for further evaluation. Author

N75-19732*# Boeing Aerospace Co., Seattle, Wash.
SUBSTANTIATION DATA FOR ADVANCED BEADED AND TUBULAR STRUCTURAL PANELS. VOLUME 3: TESTING
Philip C. Hedges and Bruce E. Greene [1974] 354 p refs
(Contract NAS1-10749)
(NASA-CR-132515) Avail: NTIS HC $10.00 CSCL 20K

The test program is described, which was conducted to provide the necessary experimental data to verify the design and analysis methods developed for beaded and tubular panels. Test results are summarized and presented for all local buckling and full size panel tests. Selected representative test data from each of these tests is presented in detail. The results of this program established a valid analysis and design procedure for circular tube panels. Test results from three other configurations show deformational modes which are not adequately accounted for in the present analyses. Author

N75-19733# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Soils and Pavements Lab.
PRESTRESSED CONCRETE PAVEMENTS. VOLUME 1: DULLES TEST ROAD INSTRUMENTATION AND LOAD TESTS Final Report
Eugene C. Odom and Richard H. Ledbetter Oct. 1974 57 p refs
(Contract DOT-FA71WAI-218)
(AD-A000456; FAM-RD-74-34-I) Avail: NTIS HC $4.25

The instrumentation of a prestressed concrete test road is described. The data obtained from a series of load tests conducted on the test road and an analysis of the data is presented. Bison strain sensors and U.S. Army Engineer Waterways Experiment Station and URS pressure cells were used to measure the strains, stresses, and deflections in the prestressed pavement, cement-treated base, and subgrade. Load tests were conducted using a truck to represent highway loads and a load cart with a simulated Boeing 747 aircraft gear to represent aircraft loads. Author

N75-19734*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
APPLICATION OF BOUNDARY INTEGRAL EQUATIONS TO ELASTOPLASTIC PROBLEMS
A. Mendelson and L. U. Albers 1975 38 p refs Proposed for presentation at Applied Mech. Conf., Troy, New York, 23-25 Jun. 1975; sponsored by ASME
(NASA-TM-X-71684; E-7658) Avail: NTIS HC $3.75 CSCL 20K

The application of boundary integral equations to elastoplastic problems is reviewed. Details of the analysis as applied to torsion problems and to plane problems is discussed. Results are presented for the elastoplastic torsion of a square cross section bar and for the plane problem of notched beams. A comparison of different formulations as well as comparisons with experimental results are presented. Author

N75-19735# National Aerospace Lab., Tokyo (Japan).
STRESSES IN A ROTATING DISK WITH CENTRAL AND NONCENTRAL HOLES (STRESS ANALYSIS BY THE FINITE ELEMENT METHOD)
Katsutoshi Matsusue, Akio Nagamatsu, Ryosaku Hashimoto, and Makoto Yonaiyama Oct. 1974 15 p refs In JAPANESE; ENGLISH summary
(NAL-TR-390) Avail: NTIS HC $3.25

Stresses on peripheries of holes in a rotating disk with central and noncentral holes are calculated by the finite element method in order to determine the stength of the disk when the additional centrifugal force acts on the circumference of the disk. Results indicate: (1) figures of stress distribution in the disk are affected by the position, the diameter and the number of the noncentral holes as well as the centrifugal force on the circumference of the disk; (2) the optimum condition which gives the smallest value of the maximum stress at the disk periphery is decided by the proper selection of the position, the diameter and the number of the noncentral holes for a given disk, and (3) the minimum of the stress concentration factor at the hole periphery, which is attainable for a given disk, can well be estimated by introducing a length ratio (total hole diameter to the peripheral length of the circle along the centers of the holes). Author

N75-19736# Joint Publications Research Service, Arlington, Va.
INDUSTRIAL CONSTRUCTION
21 Mar. 1975 75 p refs Transl. into ENGLISH from Prom. Stroit. (Moscow), no. 11, 1974 p 2-26 and p 35-37
(JPRS-64383) Avail: NTIS HC $4.25 CSCL 13M

Industrial construction projects in the U.S.S.R. are discussed. Methods of construction used in permafrost areas are described. Specific installations considered are: (1) gasoline production plant, (2) blast furnaces, (3) large span hangers, and (4) industrial buildings of girderless type. Author

N75-19737# Royal Aircraft Establishment, Farnborough (England).
THE INFLUENCE OF STRAIN RATE ON THE TRUE STRAIN AT MAXIMUM LOAD IN TENSION TESTS
A. Troost and E. El-Magd Jan. 1975 18 p refs Transl. into

ENGLISH from Metallwissenschaft und Tech., v. 27, no. 4, 1973 p 335-339
(RAE-Lib-Trans-1805; BR46402) Avail: NTIS

The exponential functions frequently employed in the literature for the formulation of stress-strain curves are associated with certain assumptions which are described. For this reason a new equation is introduced that has more general characteristics than previous ones. Using the new formula it has been possible to not only represent the results of previous work as special cases, but also (due to the introduction of a constant) to state the dependence of the true strain at the maximum load in the tension test on the nominal strain rate or on the true strain rate.
Author

N75-19738# Royal Aircraft Establishment, Farnborough (England).
ON THE EXPERIMENTAL-ANALYTICAL METHOD OF APPRAISING THE THERMAL FATIGUE STRENGTH OF STRUCTURAL COMPONENTS UNDER NON-STEADY THERMAL LOADING
G. N. Tretyachenko, L. V. Kravchuk, R. I. Kuriat, and V. A. Terletskii Dec. 1974 12 p refs Transl. into ENGLISH from Probl. Prochnosti, (USSR) v. 5, no. 11, 1973 p 61-64
(RAE-Lib-Trans-1826; BR46570) Avail: NTIS HC $3.25

A method is proposed for the complex experimental-analytical investigation of thermal fatigue strength of structural components during non steady thermal loading. The method is based on identifying the thermal fatigue-sensitive regions in a structural component, selection of an appropriate model to represent these regions and the condition for its testing, and testing the model to failure to determine the original component's thermal fatigue life. The method is applied to the problem of thermal fatigue of gas turbine blades.
Author

N75-19739# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
A GENERAL QUADRILATERAL PLATE ELEMENT
I. Torbe and K. Church [1974] 127 p refs
(AASU-329) Avail: NTIS HC $5.75

The stiffness matrix and a representation of distributed loading are derived for a general quadrilateral plate element subjected to in-plane or bending actions. Generalized nodal forces that are consistent with assumptions regarding element stresses and displacements are utilized. All integration is effected in closed form, even though the need to consider the quadrilateral to be an assemblage of triangular elements or to employ secondary nodes is eliminated. Various numerical examples, relating to plane stress and bending conditions, are considered in order to establish the validity and utility of the method. Author (ESRO)

N75-19740# Purdue Univ., Lafayette, Ind. School of Civil Engineering.
FORMULATION OF STRUCTURAL CONTROL
Jann Nan Yang and James T. P. Yao Sep. 1974 33 p refs (Grant NSF GK-36196)
(PB-238065/7; CE-STR-74-2) Avail: NTIS HC $3.75

The objective of this study is to investigate the feasibility of applying the optimum active control theory of controlling the motion and vibration of civil engineering structures. The effectiveness of the control system is measured with a performance index. The resulting optimal control law by minimizing the performance index is a linear feedback control. The optimal control of forces can be obtained by solving a matrix Riccati equation.
GRA

N75-19741# Naval Ship Research and Development Center, Bethesda, Md.
FORCED VIBRATION CALCULATION USING GENERAL BENDING RESPONSE PROGRAM (GBRP) AND THE FAST FOURIER TRANSFORM Final Report
Francis M. Henderson Aug. 1974 49 p
(SF53532106)
(AD-A001682; NSRDC-4481) Avail: NTIS CSCL 13/10

A new capability for calculating the transient response of non-uniform beam-spring models has been incorporated into the General Bending Response Program (GBRP), a digital computer program package used for ship vibration analysis. This method, which replaces the previously existing one based upon a Fourier transform approach, uses a Fourier series representation of the excitation force and response, and considers transient forces as periodic with sufficiently long periods.
GRA

N75-19742# Northwestern Univ., Evanston, Ill. Structural Mechanics Lab.
BIFURCATION OF A RUNNING CRACK IN ANTIPLANE STRAIN
J. D. Achenbach Nov. 1974 35 p refs
(Contract N00014-67-A-0356-0034; NR Proj. 064-483)
(AD-A002264; NU-SML-TR-75-2) Avail: NTIS CSCL 20/12

An elastodynamic explanation of running crack bifurcation is explored. The geometry is a semi-infinite body in a state of anti-plane strain, which contains a two-dimensional edge crack. It is assumed that a quasi-static increase of the external loads gives rise to rapid crack propagation at time $t = 0$, with an arbitrary and time-varying speed, but in the plane of the crack. The elastodynamic intensity factors are computed, and the balance of rates of energies is employed to discuss the conditions for bifurcation.
GRA

N75-19743# Northwestern Univ., Evanston, Ill. Structural Mechanics Lab.
SKEW CRACK PROPAGATION UNDER STRESS-WAVE LOADING
J. D. Achenbach Sep. 1974 8 p refs
(Contract N00014-67-A-0356-0034; NR Proj. 064-483)
(AD-A002263; NU-SML-TR-75-1) Avail: NTIS CSCL 20/12

An elastodynamic explanation is offered for propagation of a crack out of its plane (skew crack propagation), under stress-wave loading. A two-dimensional geometry is considered. An unbounded body containing a crack is subjected to a suddenly applied antiplane line load, which generates a stress wave. By employing analytical results for the intensity factors, the conditions for skew crack propagation at the instant that the crack is struck, is investigated, on the basis of the balance of rates of energies. A speed of crack propagation above which skewing can be expected is derived.
GRA

N75-19744# Naval Ship Research and Development Center, Bethesda, Md.
ENERGY ABSORPTION AND IMPACT BEHAVIOR OF STIFFENED AND UNSTIFFENED ALUMINUM PANELS
A. J. Furio, Jr. and W. E. Gilbert Nov. 1974 69 p refs
(ARPA Order 1676; SF4342703)
(AD-A002709; NSRDC-4499) Avail: NTIS CSCL 13/10

The impact behavior of stiffened and unstiffened square aluminum panels under fixed boundary conditions was investigated experimentally and theoretically, and the ultimate energy-absorbing characteristics were determined as a function of geometry. The effect of rigid, closed-cell foam (2-lb/cubic foot urethane) on an unstiffened panel was also investigated. A geometric scaling law was developed to extrapolate experimental results to sizes needed for the underbody collision protection system of surface effect vehicles for Arctic operation. Protection levels were determined as a function of allowable vertical impact velocity and craft weight.
GRA

N75-19745# Ohio State Univ. Research Foundation, Columbus.
FINITE ELEMENT ANALYSIS OF ANISOTROPIC PLATES USING Q-19 ELEMENT. PART 2: INSTRUCTIONS FOR USERS AND FORTRAN LISTINGS Final Report, Nov. 1972 - Jul. 1973
Iqbal S. Rai and Ranbir S. Sandhu Oct. 1974 72 p refs
(Contract F33615-72-C-2193; AF Proj. 4364)
(AD-A002689; OSURF-3613-73-2F; AFFDL-TR-74-120-Pt-2)
Avail: NTIS CSCL 20/11

A fully compatible quadrilateral plate bending element, designated Q-19, was developed by Clough and Felippa. A summary formulation was reported in another paper. However, a computer program employing such a finite element was not available to the Air Force. This report presents a more complete formulation of the element properties and includes a computer program. Part I of the report contains the theoretical development and Part II contains a listing of the FORTRAN code as well as instructions for usage.
GRA

N75-19746# Washington Univ., Seattle. Dept. of Mechanical Engineering.
A DYNAMIC PHOTOELASTIC ANALYSIS OF DYNAMIC TEAR TEST SPECIMEN
A. S. Kobayashi and C. F. Chan Oct. 1974 29 p refs
(Contract N00014-67-A-0103-0040)
(AD-A002431; TR-20) Avail: NTIS CSCL 20/12

Dynamic photoelasticity was used to analyze the transient response of Dynamic Tear Test (DTT) specimens, machined from .0095m (3/8 in.) thich Homalite-100 plates. Dynamic stress intensity factors, dynamic strain energy release rates, and crack velocities in ten specimens were determined. Dynamic tear energies were obtained by integrating the area under the dynamic strain energy release rate curves. The average dynamic strain energy release rates which were obtained by dividing the dynamic tear energies by the total length of the crack paths, were found to be approximately equal to the critical strain energy release rate of Homalite-100. GRA

N75-19747# Southern Methodist Univ., Dallas, Tex. Dept. of Civil and Mechanical Engineering.
BUCKLING OF STIFFENED LAMINATED COMPOSITE CIRCULAR CYLINDRICAL SHELLS WITH DIFFERENT MODULI IN TENSION AND COMPRESSION: PRELIMINARY RESULTS Final Report, 1 Apr. 1973 - 31 Jul. 1974
Robert M. Jones and Harold S. Morgan Nov. 1974 68 p refs
(Contract N00014-72-A-0296-0002; NR Proj. 064-551)
(AD-A002433) Avail: NTIS CSCL 11/4

An exact buckling criterion, within the framework of classical buckling theory, is derived for eccentrically stiffened multilayered circular cylindrical shells made of materials that have different orthotropic moduli in tension and compression. Such behavior is typical of many current composite materials. The buckling criterion is valid for arbitrary combinations of axial and circumferential loading, including axial compression and internal pressure as well as axial tension and lateral pressure. The material model (stress-strain relationship) is based on a bilinear stress-strain curve with a discontinuity in slope (modulus) at the origin. Numerical results are used to illustrate application of the buckling criterion. In particular, results are given for single-layered shells with noticeable differences in tensile and compressive moduli. Moreover, preliminary results are shown for shells laminated of advanced composite materials. Finally, the effects of eccentric stiffeners are displayed. GRA

N75-19748# Lehigh Univ., Bethlehem, Pa. Inst. of Fracture and Solid Mechanics.
A PRELIMINARY STUDY OF THE CONCEPT OF TOUGHNESS AS APPLIED TO STRUCTURES Final Report
R. J. Hartranft and G. C. Sih Jul. 1974 25 p refs
(Contract N62269-73-C-0041)
(AD-A002429; IFSM-74-65) Avail: NTIS CSCL 20/11

If the imperfections present in all materials are allowed to grow undetected, a critical size can result which will lead to a catastrophic failure. The analysis of structural toughness can provide a means of determining the amount of damage which a structure may safely sustain. This report investigates progressive damage to a discrete structure. The point of instability and the compliance as a function of the amount of damage are calculated. The limited number of computations does not permit a general definition of structural toughness in terms of the rate of increase of the compliance. GRA

N75-19749# Lehigh Univ., Bethlehem, Pa. Inst. of Fracture and Solid Mechanics.
HEURISTIC CALCULATIONS OF THE LOCAL ENERGY RELEASE RATE FOR SEMI-ELLIPTICAL SURFACE CRACKS Final Report
R. J. Hartranft and G. C. Sih Nov. 1973 48 p refs
(Contract N62269-73-C-0041)
(AD-A002428; IFSM-73-50) Avail: NTIS CSCL 20/12

A method of generating the variation of energy release rate along a crack front is discussed. Two examples of possible assumptions and the resulting consequences for crack growth are given. Special attention is given to the surface crack problem, and parameters are included which may be used to match the calculated results with experimental observations. The assumptions are acceptable if the results of the calculations agree with experiment. One of the calculations made using the computed energy release rate is of an estimate of the crack shape corresponding to a constant energy release rate along the crack front. Such an estimate can be used for comparison with experiment, for it is expected that this is the shape assumed by the crack just before rapid failure occurs. GRA

N75-19750# Army Foreign Science and Technology Center, Charlottesville, Va.
SOME TEMPERATURE PROBLEMS OF THE THEORY OF PLASTIC HEREDITY
A. M. Simonyan 31 Mar. 1974 9 p Transl. into ENGLISH from the book "Prochnost' i plastichnost" Moscow, Nauka, 1971 p 224-228
(AD-A002638; FSTC-HT-23-1750-73) Avail: NTIS CSCL 20/11

The paper presents a discussion of the stress-strain state of a tube and a hollow sphere revolving in the thermal flux under the action of pressure loads at their surfaces. An expression containing an auxiliary function is derived to represent the problem, and a successive approximation procedure is proposed to solve the problem. A geometric interpretation of the procedure is given and the results are illustrated by numerical examples. Approximate solutions are also obtained with allowance for random temperature dependences of creep. GRA

N75-19290 Welding Inst., Cambridge (England).
METALLOGRAPHIC ASSESSMENT OF SKYLAB EXPERIMENT M551
J. G. Garland and D. McKeown *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 45-64 refs (For availability see N75-19285 11-12)

N75-20214 European Space Research Organization, Paris (France).
THE BRANCH MODE METHOD APPLIED FROM EXPERIMENTAL VIBRATION MODES
Rolland Dat *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1974-2 (ESRO-TT-113) Dec. 1974 p 102-110 Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1974-2, Mar.-Apr. 1974 p 112-114 (For availability see N75-20207 11-99)

42 GEOSCIENCES (GENERAL)

N75-19751 Colorado State Univ., Fort Collins.
SECONDARY ICE PARTICLE PRODUCTION FROM RIMED ICE Ph.D. Thesis
Teizi Henmi 1974 143 p
Avail: Univ. Microfilms Order No. 74-27949

The high ratios of ice particles to those of ice nuclei observed in convective type clouds are studied along with physical mechanisms suggested to explain the multiplication of the particles. Special attention was given to the experimental study of riming processes and rimed ice on ice multiplication. These investigations were made to: (1) study secondary ice particle production from ice during its growth by the riming process, and (2) study secondary ice particle production due to the evaporation process of ice which was also formed by riming. The possibility that atmospheric graupel particles could possess favorable physical characteristics similar to those of rimed ice for producing secondary ice particles was also explored. It was concluded, using simple model calculations, that an ice multiplication rate on the order of several per minute in a cumulus cloud, could be explained by the production of secondary ice particles due to evaporation of falling grauple particles. Dissert. Abstr.

N75-19752*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
TABLES FOR DETERMINING LEAD, URANIUM, AND THORIUM ISOTOPE AGES
Ernest Schonfeld Dec. 1974 35 p refs
(NASA-TM-X-58145; JSC-09177) Avail: NTIS HC $3.75 CSCL 20H

Tables for determing lead, uranium, and thorium isotope ages are presented in the form of computer printouts. Decay constants, analytical expressions for the functions evaluated, and the precision of the calculations are briefly discussed. Author

N75-19753# Joint Publications Research Service, Arlington, Va.
METEOROLOGY AND HYDROLOGY NO. 12, 1974
Ye. I. Tolstikov, ed. 3 Mar. 1975 194 p refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 3-118
(JPRS-64222) Avail: NTIS HC $7.00

Selected articles consider hydrometeorological aspects of weather forecasting, microclimate, aerological research, and computer techniques for meteorological data processing. For individual titles, see N75-19754 through N75-19771.

N75-19754 Joint Publications Research Service, Arlington, Va.
STUDY OF THE EFFECT OF OIL POLLUTION, SALINITY AND OTHER FACTORS ON THE OPTICAL PROPERTIES OF WATER IN THE INFRARED PART OF THE SPECTRUM **c48**
V. V. Bogorodskiy, M. A. Kropotkin, and T. Yu. Sheveleva *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 1-9 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 3-9 (For availability see N75-19753 11-42)

The effects of oil pollution, salinity, foam and other factors on the infrared spectral reflection by water and the reflection of the emission of a CO2 laser from water are studied. Author

N75-19755 Joint Publications Research Service, Arlington, Va.
REPRODUCTION OF THE WIND FIELD IN A CYCLONE BY SATELLITE AND RADIOSONDE DATA AS A PROBLEM OF FOUR-DIMENSIONAL ANALYSIS **c47**
D. M. Sonechkin and I. A. Belokurova *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 10-22 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 10-20 (For availability see N75-19753 11-42)

The wind field in a cyclone is reproduced by the form of its cloud vortex observed by a television survey from satellites and the data from a sparse wind sounding network. Author

N75-19756 Joint Publications Research Service, Arlington, Va.
PECULIARITIES OF THE INTERRELATION OF THE PROCESSES OF SUMMER CIRCULATION IN THE STRATOSPHERE AND TROPOSPHERE AND AIR TEMPERATURE FORECASTING FOR THREE RUNNING FIVE-DAY PERIODS **c46**
Kh. Kh. Rafailova and L. P. Yemelyanova *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 23-32 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 21-28 (For availability see N75-19753 11-42)

The characteristic features of the interrelation of the summer circulation in the stratosphere and troposphere are revealed, and a schematic is presented for the calculation of the air temperature forecast using a computer for three running five day periods. The peculiarities of the circulation in the lower and middle stratosphere are combined with the characteristics of the troposphere and the underlying surface. Author

N75-19757 Joint Publications Research Service, Arlington, Va.
FREQUENCY OF A CLEAR SKY OVER THE TERRITORY OF THE SOVIET UNION DURING DAYLIGHT HOURS **c46**
Sh. P. Darchiya, V. I. Ivanov, and P. G. Kovadlo *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 33-39 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 29-34 (For availability see N75-19753 11-42)

General information is presented on the frequency of a clear sky over the entire territory of the U.S.S.R. for every hour of the day. The selected stations were characterized by maximum frequency of a clear sky at 1300 hours mean solar time with respect to all months of the year. Author

N75-19758 Joint Publications Research Service, Arlington, Va.
ADVECTIVE PECULIARITIES OF THE WEATHER ON THE EAST COAST OF THE CHUKOTKA NATIONAL OKRUG IN THE WINTER **c47**
T. V. Trutko *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 40-46 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 35-41 (For availability see N75-19753 11-42)

A study is made of the peculiarities of the winter weather regime on the east coast of Chukotka caused by atmospheric circulation. The climatic characteristic of the types of weather formed as a result of advection of the air masses from the different regions is presented. Author

N75-19759 Joint Publications Research Service, Arlington, Va.
SIZE OF TYPHOON CLOUD SYSTEMS **c47**
L. S. Minina and Din Ba Chan *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 47-56 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 42-49 (For availability see N75-19753 11-42)

On the basis of an analysis of the synoptic and satellite data, the sizes of typhoon cloud systems which indirectly characterize the intensity of the typhoons are defined. The relation was discovered for the variation of size of the cloud disc of typhoons as a function of a number of meteorological parameters. Author

N75-19760 Joint Publications Research Service, Arlington, Va.
ESTIMATE OF THE POSSIBILITY OF USING THE DATA FROM A NETWORK OF THREE MRL RADARS FOR DETERMINING THE POSITION OF ATMOSPHERIC FRONTS **c47**
G. B. Brylev and G. L. Nizdoyminoga *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 57-66 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 50-57 (For availability see N75-19753 11-42)

On the basis of a joint analysis of synoptic maps and the results of observations of the three MRL radars of the Belorussian SSR Administration of the Hydrometeorological Service at synchronous times, an estimate was made of the possibility of using radar information for the determination and more precise definition of the positions of atmospheric fronts. Author

N75-19761 Joint Publications Research Service, Arlington, Va.
PROCEDURE FOR FORECASTING THE MONTHLY AMOUNT OF PRECIPITATION IN THE TRANSCAUCASUS USING DISCRIMINANT ANALYSIS **c47**
A. A. Davitaya *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 67-72 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 58-62 (For availability see N75-19753 11-42)

A procedure is presented for forecasting the monthly amount of precipitation with respect to individual parts of the Transcaucasus. Discriminant functions are constructed for the cold and warm parts of the year. A check is made of the discussed forecasting scheme on dependent and independent materials. Author

N75-19762 Joint Publications Research Service, Arlington, Va.
PROCEDURE FOR CALCULATING THE RADIATION BALANCE COMPONENTS OF THE OCEAN SURFACE **c48**
G. V. Girdyuk and T. V. Kirillova *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 73-81 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 63-69 (For availability see N75-19753 11-42)

A new procedure is proposed for calculating the components of the radiation balance of the ocean surface based on generalizing the materials of the ship actinometric observations. Author

N75-19763 Joint Publications Research Service, Arlington, Va.
INTEGRAL CURRENT FUNCTION METHOD OF SOLVING THE PROBLEM OF THE WIND-DRIVEN CURRENT WITH SLIDING IN A STREAM **c46**
V. S. Sinelshchikov *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 82-92 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 70-77 (For availability see N75-19753 11-42)

A computer solution is reported for the problem of the speeds of a wind driven current in a river or canal considering the

actual friction against the bottom of the stream. The results of the solution can be used to calculate the areas of propagation of waste water upstream along the river in the case of an unfavorable wind. Author

N75-19764 Joint Publications Research Service, Arlington, Va.
A MECHANISM OF SOIL MOISTURE ACCUMULATION IN DESERTS c46
V. I. Vorobyev *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 93-99 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 78-82 (For availability see N75-19753 11-42)

A theoretical model is reported that describes the mechanism of soil moisture accumulation in the deserts as a result of atmospheric vapor. The system of transcendental equations obtained makes it possible to calculate the heat and moisture fluxes by the given parameters in the free atmosphere and the microphysical soil characteristics. It is possible to use the developed method to estimate the moisture balance in the deserts, to calculate the intrasoil irrigation, investigate the effects of mulching, and so on. Author

N75-19765 Joint Publications Research Service, Arlington, Va.
SOME GEOSTROPHIC MODELS c47
G. S. Dvoryaninov *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 100-107 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 83-87 (For availability see N75-19753 11-42)

Analyses of some geostrophic models are presented. In the stationary case a unique relation was obtained between the meridional and vertical components of the pressure gradient. It is demonstrated that in the evolutionary problem the velocity increment vector for small times coincides with the direction of the pressure gradient vector, and for large t it is orthogonal to the vector of the deviation of the gradient from its mean value. The conclusion was drawn of the inapplicability of the models for calculating the wind and currents. Author

N75-19766 Joint Publications Research Service, Arlington, Va.
PROBLEM OF GEOSTROPHIC APPROXIMATIONS OF WIND VELOCITY c47
N. A. Bagrov *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 108-113 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 88-91 (For availability see N75-19753 11-42)

It is pointed out that although the general solution indicated by V. I. Gubin is entirely valid, all of the efforts to use this solution under specific geophysical conditions have led to erroneous results. In order to obtain direct results it is necessary to consider the vertical component of the Coriolis acceleration included in the gravitational acceleration. Then the well known formulas of the geostrophic wind are obtained. Author

N75-19767 Joint Publications Research Service, Arlington, Va.
COMPARISON OF THE SOVIET AND AMERICAN SYSTEMS OF SHIP RADIOSOUNDING OF THE ATMOSPHERE c46
K. I. Goltsova, O. V. Marfenko, M. A. Petrosyants, and V. D. Reshetov *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 114-124 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 92-97 (For availability see N75-19753 11-42)

Results are presented from comparisons of the Meteorit-RKZ-2 ship sounding system and the American Omega system performed in the southern part of the Atlantic Ocean in the summer of 1973 in preparation for the Atlantic tropical experiment. Author

N75-19768 Joint Publications Research Service, Arlington, Va.
CENTRAL HIGH-ALTITUDE HYDROMETEOROLOGICAL OBSERVATORY c47
V. M. Sklyarov *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 125-132 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 98-102 (For availability see N75-19753 11-42)

The basic problems and primary aspects of the activity of one of the youngest institutions in the U.S.S.R. hydrometeorological service -- the Central High Altitude Hydrometeorological Observatory -- are discussed. Author

N75-19769 Joint Publications Research Service, Arlington, Va.
EXPERIMENT IN THE COMPARISON OF NUMERICAL WEATHER FORECASTING SCHEMES OF THE AMERICAN NATIONAL METEOROLOGICAL CENTER AND THE COMPUTATION CENTER OF THE SIBERIAN DIVISION OF THE USSR ACADEMY OF SCIENCES c47
G. R. Kontarev *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 133-145 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 102-108 (For availability see N75-19753 11-42)

The operative weather forecasting complex of the U.S. National Meteorological Center (NMC), the operating procedures and the methods of insuring high quality forecasting are described. A conclusion is drawn that the accuracy of the forecasts by the NMC is determined by the broad use of the man machine system based on applying the technical media for communication of man with a computer. Experimental results are presented by comparison with the numerical schemes for short range weather forecasting for a limited territory developed at the NMC and the computation center of the Siberian Department of the U.S.S.R. Academy of Sciences. The scheme used by the computation center of the Siberian Department of the U.S.S.R. Academy of Sciences requires 20 times less machine time than the NMC system. Author

N75-19770 Joint Publications Research Service, Arlington, Va.
STUDIES OF THE UPPER ATMOSPHERE BY MEANS OF MR-12 ROCKETS c46
Yu. F. Ivanov, V. P. Teslenko, A. A. Shidlovskiy, A. A. Fokin, V. A. Shchukin, and M. P. Arzhakov *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 146-150 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 109-111 (For availability see N75-19753 11-42)

The results of 10 years of use of the MR-12 meteorological rocket to study the upper atmosphere are summed up. The areas of rocket research and the trends in the development of scientific programs executed by the institutions of the U.S.S.R. hydrometeorological service are demonstrated. Author

N75-19771 Joint Publications Research Service, Arlington, Va.
GLOBAL ATMOSPHERIC RESEARCH PROGRAM (GARP) c48
Ye. P. Borisenkov *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 155-162 Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 114-117 (For availability see N75-19753 11-42)

An important result of the planning and implementation of GARP was the fact that on the basis of this program not only the problems of atmospheric physics but also the problems of the physics of the ocean, applied mathematics and computer engineering, the technical problems of observation systems, and so on have been coordinated. Author

N75-19772*# Old Dominion Univ., Norfolk, Va. School of Engineering.
THE EFFECT OF SHEARING STRAIN-RATE ON THE ULTIMATE SHEARING RESISTANCE OF CLAY Final Technical Report
Robert Y. K. Cheng Mar. 1975 40 p refs
(Grant NGL-47-003-012)
(NASA-CR-142261; TR-75-CI) Avail: NTIS HC $3.75 CSCL 08M

An approach for investigating the shearing resistance of cohesive soils subjected to a high rate of shearing strain is described. A fast step-loading torque apparatus was used to induce a state of pure shear in a hollow cylindrical soil specimen. The relationship between shearing resistance and rate of shear deformation was established for various soil densities expressed in terms of initial void ratio or water content. For rate of shearing deformation studies, the shearing resistance increases initially with shearing velocity, but subsequently reaches a terminal value as the shearing velocity increases. The terminal shearing resistance is also found to increase as the density of the soil increases. The results of this investigation are useful in the rheological study of clay. It is particularly important for mobility problems of soil runways, since the soil resistance is found to be sensitive to the rate of shearing. Author

N75-19773*# Clemson Univ., S.C. Dept. of Horticulture.
CROP STATUS EVALUATIONS AND YIELD PREDICTIONS Annual Summary Report, 1 Apr. 1974 - 31 Mar. 1975
J. R. Haun 24 Apr. 1975 41 p refs
(Contract NAS9-14006)
(NASA-CR-142260) Avail: NTIS HC $3.75 CSCL 02C

The growth-environment relationships for greenhouse and field conditions are compared, and the development of growth-prediction models for spring wheat is discussed along with the development of models for predicting the date for spring wheat emergence in North Dakota. F.O.S.

N75-19774# Joint Publications Research Service, Arlington, Va.
SOVIET BLOC RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE, NO. 344
10 Mar. 1975 54 p refs Transl. into ENGLISH from various Russian reports
(JPRS-64276) Avail: NTIS HC $4.25

Translations and abstracts are presented of articles on meteorology, oceanography, upper atmosphere and space research, astronomy and terrestrial geophysics, covering both scienke news and formal scientific reports. Published details of Soviet space spectaculars are included. Author

N75-19775# Spangle (William) and Associates, Portola Valley, Calif.
APPLICATION OF EARTH SCIENCE INFORMATION IN URBAN LAND-USE PLANNING, STATE-OF-THE-ART REVIEW AND ANALYSIS Final Report
22 Feb. 1974 341 p refs Prepared in cooperation with Baxter, McDonald and Smart, Inc., San Francisco, and Leighton (F. Beach) and Associates, La Habra, Calif. and Sponsored by USGS
(PB-238081/4; USGS-GD-74-038; Rept-5) Avail: NTIS HC $9.50 CSCL 13B

The report is an assessment of the state of the art (1974) in the application of earth science information of urban land-use planning and decision making. It includes an overview of the land use planning process, a discussion of natural resources and hazards, examples, sources, and applications of earth science information, a discussion of the interface between the earth sciences and land-use planning, and guidelines for planning and management applications of earth-science information. An appendix documents 20 case histories of the use of earth-science information in a wide range of planning applications at state, regional, county, and municipal levels of government. GRA

N75-19776# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
CALCULATING SNOW COVER DENSITY IN THE KYZYLCHA MOUNTAIN RIVER BASIN
Yu. B. Sadvaksov and E. M. Kozik Sep. 1974 12 p refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 11, 1972 p 77-82
(AD-A002066; CRREL-TL-415) Avail: NTIS CSCL 08/12

All information available on snow cover in the Kyzylcha Mountain River Basin was examined. Connections between density and values of meteorological elements were sought for each month between December and April. In most months, the maximum influence on density of snow cover is exerted by the sums of positive 13 hr temperatures and the total of precipitation computed from 1 December to the day of the snow survey. GRA

N75-19777# IIT Research Inst., Chicago, Ill.
IMPACT OF EXTREMELY LOW FREQUENCY ELECTROMAGNETIC FIELDS ON SOIL ARTHROPODS. ONGOING STUDIES AT THE PROJECT SANGUINE WISCONSIN TEST FACILITY, 1973
Bernard Greenberg and Noreen Ash Nov. 1974 41 p refs Prepared in cooperation with Illinois Univ., Chicago
(Contracts N00039-73-C-0030; N00039-72-C-0106)
(AD-A001924) Avail: NTIS CSCL 06/18

Possible long-term Sanguine impact on soil arthropods was studied in nine test plots and six control plots. Comparisons of test and control populations of mites and Collembola include statistical treatment of within-year and between-year numbers, predator proportions, Cryptostigmata: Collembola ratios, and Cryptostigmata: Mesostigmata ratios. A striking result is the synchronicity and uniform amplitude of population cycles seen in a three-year perspective in the control and test plots. These similarities in population numbers are supported by analysis of variance in all cases but one. The observations support a conclusion that following four years of operation, Sanguine electromagnetic fields have had no demonstrable effect on the arthropod populations under study. GRA

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography*.

N75-19778 Stanford Univ., Calif.
STATISTICAL ESTIMATION OF WILDCAT WELL OUTCOME PROBABILITIES BY VISUAL ANALYSIS OF STRUCTURE CONTOUR MAPS OF STAFFORD COUNTY, KANSAS Ph.D. Thesis
Alfredo Eduardo Prelat 1974 117 p
Avail: Univ. Microfilms Order No. 74-27084

The development of a method to estimate wildcat well outcome probabilities is described. The work involved analysis of a sequence of structure contour maps of three subsurface horizons (top of the Arbuckle Group, top of the Lansing Group, and top of the Stone Corral Formation) in a 24-by-24 mile area in northern Stafford County, Kansas. The principal technique employed is the so-called re-experience technique in which a succession of maps is prepared to represent the geology interpreted on the basis of different amounts of information. Each map prepared represents the interpreted subsurface structure based on information available at a particular time in the area's oil-field development history (as for example, at the end of 1940). Geologic data from all wildcat wells and selected infield wells that had been drilled prior to the date of the map were used in preparation of the map, but no geologic information from wells drilled after the date of a particular map was used. Dissert. Abstr.

N75-19779 Tennessee Univ., Knoxville.
DATA ACQUISITION AND INTERPRETATION FOR QUANTITATIVE THERMAL MAPPING Ph.D. Thesis
Gerhard Kreikebaum 1974 131 p
Avail: Univ. Microfilms Order No. 74-27218

An approach is presented to remote water surface temperature measurements using an airborne infrared line scanner or thermal mapper. The objective is a temperature determination with errors less than 0.3 C in the presence of an intervening atmospheric and reflection from the water surface. The approach was (1) to modify and partially redesign an existing infrared scanner, including its data processing electronics, to make it capable of quantitative radiation measurements with the absolute accuracy and the temperature sensitivity required, and to minimize atmospheric and reflectivity effects by selection of a 9.5-11.5 micrometer wavelength band as the operating range of the instrument; (2) to develop a model in order to correct for atmospheric and reflectivity effects. The model predicts these effects as a function of air temperature, sky radiance, aircraft altitude, viewing angle and amount of atmospheric attenuation; and (3) to empirically find some or all of these parameters determining atmospheric and reflectivity effects by the thermal mapper data itself, thus obtaining a quantitative thermal map with few or no auxiliary measurements, particularly no surface measurements. Dissert. Abstr.

N75-19780*# Geological Survey, Reston, Va.
CARTOGRAPHIC EVALUATION OF SKYLAB S-192 SCANNER IMAGES Quarterly Progress Report, 1 Nov. 1974 - 31 Jan. 1975
John D. McLaurin, Principal Investigator 31 Jan. 1975 7 p EREP
(NASA Order T-4111-B)
(E75-10156; NASA-CR-142180) Avail: NTIS HC $3.25 CSCL 08B

There are no author-identified significant results in this report.

N75-19781*# Colorado School of Mines, Golden. Dept. of Geology.
GEOLOGIC AND MINERAL AND WATER RESOURCES INVESTIGATIONS IN WESTERN COLORADO, USING SKYLAB EREP DATA Monthly Progress Report, Jan. - Feb. 1975
Keenan Lee, Principal Investigator 7 Mar. 1975 7 p EREP
(Contract NAS9-13394)
(E75-10157; NASA-CR-142181) Avail: NTIS HC $3.25 CSCL 08F

There are no author-identified significant results in this report.

N75-19782*# Environmental Research Inst. of Michigan, Ann Arbor.
STUDY OF RECREATIONAL LAND AND OPEN SPACE USING SKYLAB IMAGERY Monthly Progress Report, Jan. 1975
Irvin J. Sattinger, Principal Investigator 20 Feb. 1975 5 p EREP
(Contract NAS9-13283)
(E75-10158; NASA-CR-142182; ERIM-103300-44-L) Avail: NTIS HC $3.25 CSCL 08B

There are no author-identified significant results in this report.

N75-19783*# North Carolina State Univ., Raleigh. School of Physical and Mathematical Sciences.
UTILIZATION OF EREP DATA IN GEOLOGICAL EVALUATION REGIONAL PLANNING, FOREST MANAGEMENT, AND WATER MANAGEMENT IN NORTH CAROLINA Quarterly Progress Report, Dec. 1974 - Feb. 1975
Charles W. Welby, Principal Investigator 6 Mar. 1975 7 p EREP
(Contract NAS9-13321)
(E75-10159; NASA-CR-142183) Avail: NTIS HC $3.25 CSCL 08G

There are no author-identified significant results in this report.

N75-19784*# Nevada Univ., Reno. Mackay School of Mines.
THE GREAT BASIN INVESTIGATION Monthly Progress Report, Mar. 1975
Jack G. Quade, Principal Investigator 20 Mar. 1975 2 p EREP
(Contract NAS9-13274)
(E75-10160; NASA-CR-142209) Avail: NTIS HC $3.25 CSCL 08E

There are no author-identified significant results in this report.

N75-19785*# Michigan State Univ., East Lansing. Agricultural Experiment Station.
THE USE OF ERTS DATA FOR A MULTIDISCIPLINARY ANALYSIS OF MICHIGAN RESOURCES Final Report
Axel L. Andersen, Principal Investigator, Wayne L. Myers, Gene R. Safir, Delbert L. Mokma, Eugene P. Whiteside, Harold A. Winters, Richard Rieck, William A. Malila, Jane E. Sarno, Thomas W. Wagner et al Nov. 1974 104 p refs Prepared in cooperation with Environmental Research Inst. of Michigan Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21834)
(E75-10161; NASA-CR-142210) Avail: NTIS HC $5.25 CSCL 08F

There are no author-identified significant results in this report.

N75-19786*# Earth Satellite Corp., Washington, D.C.
EVALUATION OF SKYLAB EREP DATA FOR LAND RESOURCE MANAGEMENT
David S. Simonett, Principal Investigator, Jack B. Bale, Wayne G. Rhode, and Darryl Goehring Jan. 1975 84 p refs Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-13314)
(E75-10162; NASA-CR-142211) Avail: NTIS HC $4.75 CSCL 08B

There are no author-identified significant results in this report.

N75-19787*# Agricultural Research Service, Weslaco, Tex.
IRRIGATION SCHEDULING, FREEZE WARNING AND SOIL SALINITY DETECTING Monthly Progress Report, Feb. 1975
Craig L. Wiegand, Principal Investigator Feb. 1975 5 p EREP
(NASA Order T-4105-B)
(E75-10163; NASA-CR-142212; MPR-14) Avail: NTIS HC $3.25 CSCL 02C

There are no author-identified significant results in this report.

N75-19788*# Sheffield Univ. (England). Dept. of Geography.
AUTOMATIC DATA EXTRACTION OF EARTH RESOURCES INFORMATION FROM SKYLAB IMAGERY OF S.E. SPAIN
J. L. vanGenderen, Principal Investigator Mar. 1975 16 p refs Sponsored by NASA EREP
(E75-10164; NASA-CR-142213) Avail: NTIS HC $3.25 CSCL 05B

There are no author-identified significant results in this report.

N75-19789*# Boeing Co., Seattle, Wash.
QUANTITATIVE DETERMINATION OF STRATOSPHERIC AEROSOL CHARACTERISTICS Monthly Report, Feb. 1975
David L. Tingey, Principal Investigator Feb. 1975 11 p EREP
(Contract NAS9-13303)
(E75-10165; NASA-CR-142214) Avail: NTIS HC $3.25 CSCL 04A

There are no author-identified significant results in this report.

N75-19790*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
STUDY OF THE UTILIZATION OF EREP DATA FROM THE WABASH RIVER BASIN Monthly Report, Feb. 1975
LeRoy F. Silva, Principal Investigator Feb. 1975 2 p EREP
(Contract NAS9-13301)
(E75-10166; NASA-CR-142215) Avail: NTIS HC $3.25 CSCL 08E

There are no author-identified significant results in this report.

N75-19791*# Rockwell International Science Center, Thousand Oaks, Calif.
IDENTIFICATION AND INTERPRETATION OF TECTONIC FEATURES FROM SKYLAB IMAGERY Monthly Report, 1 Feb. - 28 Feb. 1975
Monem Abdel-Gawad, Principal Investigator 24 Mar. 1975 2 p EREP
(Contract NAS9-14440)
(E75-10167; NASA-CR-142216; SC5007.8MR) Avail: NTIS HC $3.25 CSCL 08E

The author has identified the following significant results. Although the enlargements made from the EREP image have an inferior resolution relative to the unenlarged U-2 images, we were able to recognize geomorphologic features associated with recent fault breaks. Author

N75-19792*# Cornell Univ., Ithaca, N.Y. Coll. of Agriculture.
EVALUATION OF SKYLAB IMAGERY AS AN INFORMATION SERVICE FOR INVESTIGATING LAND USE AND NATURAL RESOURCES Progress Report, 1 Feb. - 28 Feb. 1975
Ernest E. Hardy, Principal Investigator 28 Feb. 1975 2 p EREP
(Contract NAS9-13364)
(E75-10168; NASA-CR-142217) Avail: NTIS HC $3.25 CSCL 08B

There are no author-identified significant results in this report.

N75-19793*# Naval Research Lab., Washington, D.C.
TERRAIN PROPERTIES AND TOPOGRAPHY FROM SKYLAB ALTIMETRY Monthly Progress Report, Jan. - Feb. 1975
Allan Shapiro, Principal Investigator 19 Mar. 1975 1 p EREP
(NASA Order T-4716-B)
(E75-10169; NASA-CR-142218) Avail: NTIS HC $3.25 CSCL 08B
There are no author-identified significant results in this report.

N75-19794*# Environmental Research Inst. of Michigan, Ann Arbor.
DEVELOPING PROCESSING TECHNIQUES FOR SKYLAB DATA Monthly Progress Report, Feb. 1975
Richard F. Nalepka, William A. Malila, Principal Investigators, and James P. Morgenstern 20 Mar. 1975 3 p EREP
(Contract NAS9-13280)
(E75-10170; NASA-CR-142219; ERIM-101900-50-L) Avail: NTIS HC $3.25 CSCL 05B
There are no author-identified significant results in this report.

N75-19795*# Environmental Research Inst. of Michigan, Ann Arbor.
STUDY OF RECREATIONAL LAND AND OPEN SPACE USING SKYLAB IMAGERY Monthly Progress Report, Feb. 1975
Irvin J. Sattinger, Principal Investigator 19 Mar. 1975 3 p EREP
(Contract NAS9-13283)
(E75-10171; NASA-CR-142220; ERIM-103300-46-L) Avail: NTIS HC $3.25 CSCL 08B
There are no author-identified significant results in this report.

N75-19796*# Environmental Research Inst. of Michigan, Ann Arbor.
OIL POLLUTION DETECTION, MONITORING AND LAW ENFORCEMENT Quarterly Progress Report, Feb. 1975
Robert Horvath, Principal Investigator 20 Mar. 1975 2 p EREP
(Contract NAS9-13281)
(E75-10172; NASA-CR-142221; ERIM-101800-18-P) Avail: NTIS HC $3.25 CSCL 13B
There are no author-identified significant results in this report.

N75-19797*# South Carolina State Development Board, Columbia. Div. of Geology.
APPLICATION OF MULTISPECTRAL PHOTOGRAPHY TO MINERAL AND LAND RESOURCES OF SOUTH CAROLINA Quarterly Progress Report
Norman K. Olson, Principal Investigator 5 Mar. 1975 38 p refs
(Contract NAS8-29617)
(E75-10173; NASA-CR-142222; QPR-4; QPR-5) Avail: NTIS HC $3.75 CSCL 08G
There are no author-identified significant results in this report.

N75-19798*# Northern Prairie Wildlife Research Center, Jamestown, N. Dak.
UTILIZATION OF SKYLAB (EREP) SYSTEM FOR APPRAISING CHANGES IN CONTINENTAL MIGRATORY BIRD HABITAT Monthly Progress Report, Feb. 1975
David S. Gilmer, Principal Investigator Feb. 1975 3 p EREP
(NASA Order T-4114-B)
(E75-10174; NASA-CR-142223) Avail: NTIS HC $3.25 CSCL 06C
There are no author-identified significant results in this report.

N75-19799*# California Earth Science Corp., Santa Monica.
FAULT TECTONICS AND EARTHQUAKE HAZARDS IN THE PENINSULAR RANGES, SOUTHERN CALIFORNIA Monthly Progress Report, Feb. 1975
Paul M. Merifield, Principal Investigator 5 Mar. 1975 2 p EREP
(Contract NAS2-7698)
(E75-10175; NASA-CR-142224; MPR-21) Avail: NTIS HC $3.25 CSCL 08E
There are no author-identified significant results in this report.

N75-19800*# Environmental Research and Technology, Inc., Lexington, Mass.
STUDY TO DEVELOP IMPROVED SPACECRAFT SNOW SURVEY METHODS USING SKYLAB/EREP DATA Quarterly Progress Report, 15 Dec. 1974 - 15 Mar. 1975
James C. Barnes, Principal Investigator Mar. 1975 7 p EREP
(Contract NAS9-13305)
(E75-10176; NASA-CR-142225; QPR-8) Avail: NTIS HC $3.25 CSCL 08L
There are no author-identified significant results in this report.

N75-19801# Canada Centre for Remote Sensing, Ottawa (Ontario). Program Planning and Evaluation.
BENEFITS OF REMOTE SENSING OF SEA ICE
A. K. McQuillan and Donald J. Clogh (Univ. of Waterloo) Dec. 1973 32 p refs Supersedes Ref-73-20
(RR-73-3; Ref-73-20) Avail: NTIS HC $3.75 CSCL 08L
A preliminary analysis of the benefits and costs of remote sensing of sea ice in the Arctic, the Gulf of St. Lawrence and the East Coast Offshore is presented. Author

N75-19802*# Environmental Research Inst. of Michigan, Ann Arbor.
MULTISPECTRAL SCANNER DATA APPLICATIONS EVALUATION. VOLUME 1: USER APPLICATIONS STUDY Final Report, Jan. - Jul. 1974
F. J. Thomson, J. D. Erickson, R. F. Nalepka, and J. D. Weber Dec. 1974 355 p refs Original contains color illustrations
(Contract NAS9-13386)
(NASA-CR-141689; ERIM-102800-40-F-Vol-1; JSC-09241-Vol-1) Avail: NTIS HC $10.00 CSCL 14B
A six-month systems study of earth resource surveys from satellites was conducted and is reported. SKYLAB S-192 multispectral scanner (MSS) data were used as a baseline to aid in evaluating the characteristics of future systems using satellite MSS sensors. The study took the viewpoint that overall system (sensor and processing) characteristics and parameter values should be determined largely by user requirements for automatic information extraction performance in quasi-operational earth resources surveys, the other major factor being hardware limitations imposed by state-of-the-art technology and cost. The objective was to use actual aircraft and spacecraft MSS data to outline parametrically the trade-offs between user performance requirements and hardware performance and limitations so as to allow subsequent evaluation of compromises which must be made in deciding what system(s) to build. Author

N75-19803*# Honeywell, Inc., Lexington, Mass.
MULTISPECTRAL SCANNER DATA APPLICATIONS EVALUATION. VOLUME 2: SENSOR SYSTEM STUDY Final Report
Dec. 1974 112 p refs Prepared for Environmental Research Inst. of Michigan, Ann Arbor
(Contract NAS9-13386)
(NASA-CR-141690; ERIM-102800-40-F-Vol-2) Avail: NTIS HC $5.25 CSCL 14B
The optimization of a thematic mapper for earth resources application is discussed in terms of cost versus performance. Performance tradeoffs and the cost impact are analyzed. The instrument design and radiometric performance are also described. The feasibility of a radiative cooler design for a scanning spectral radiometer is evaluated along with the charge coupled multiplex operation. Criteria for balancing the cost and complexity of data acquisition instruments against the requirements of the user, and a pushbroom scanner version of the thematic mapper are presented. F.O.S.

N75-19804*# Martin Marietta Corp., Baltimore, Md.
SKYLAB PROGRAM EARTH RESOURCES EXPERIMENT PACKAGE. VOLUME 5: SENSOR PERFORMANCE EVALUATION (S193 ALT) Final Report
Gerald P. Kenney 2 Jan. 1975 147 p
(Contract NAS8-24000)
(NASA-CR-141716; MSC-05546-Vol-5) Avail: NTIS HC $5.75 CSCL 14B

The results are summarized of S193 altimeter sensor performance evaluation based on data presented to the sensor performance evaluation interim reports. The results of additional analyses of S193 altimeter performance are presented, and techniques used in sensor performance evaluation are described. Significant performance degradation identified during the Skylab missions and the performance achieved are described in terms of pertinent S193 altimeter parameters. The additional analyses include final performance analyses completed after submittal of the SL4 interim sensor performance evaluation reports, including completion of detailed analyses of basic performance parameters initiated during the interim report periods. Author

N75-19805*# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
STUDY OF USGS/NASA LAND USE CLASSIFICATION SYSTEM Interim Technical Report
G. William Spann and N. L. Faust Dec. 1974 48 p refs
(Contract NAS8-30653)
(NASA-CR-120709) Avail: NTIS HC $3.75 CSCL 08B

It is known from several previous investigations that many categories of land-use can be mapped via computer processing of Earth Resources Technology Satellite data. The results are presented of one such experiment using the USGS/NASA land-use classification system. Douglas County, Georgia, was chosen as the test site for this project. It was chosen primarily because of its recent rapid growth and future growth potential. Results of the investigation indicate an overall land-use mapping accuracy of 67% with higher accuracies in rural areas and lower accuracies in urban areas. It is estimated, however, that 95% of the State of Georgia could be mapped by these techniques with an accuracy of 80% to 90%. Author

N75-19806# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
[FIELD OPERATIONS AND LABORATORY STUDIES ON MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS IN AUSTRALIA] Annual Report, 1973
1974 106 p refs
Avail: NTIS HC $5.25

The principal activities of the Bureau of Mineral Resources are reported. Major areas studied include the following: geological mapping; aeromagnetic and radiometric surveys; seismicity of Australia and New Guinea; Landsat 1 and Skylab imagery; and marine geology. J.M.S.

N75-19807*# South Dakota State Univ., Brookings. Remote Sensing Inst.
USE OF REMOTE SENSING TECHNOLOGY FOR INVENTORYING AND PLANNING UTILIZATION OF LAND RESOURCES IN SOUTH DAKOTA Semiannual Progress Report, 1 Jul. - 31 Dec. 1974
31 Dec. 1974 72 p refs Original contains color illustrations
(Grant NGL-42-003-007)
(NASA-CR-142348; SDSU-RSI-75-02) Avail: NTIS HC $4.25 CSCL 08B

A comprehensive land use planning process model is being developed in Meade County, South Dakota, using remote sensing technology. The proper role of remote sensing in the land use planning process is being determined by interaction of remote sensing specialists with local land use planners. The data that were collected by remote sensing techniques are as follows: (1) level I land use data interpreted at a scale of 1:250,000 from false color enlargement prints of ERTS-1 color composite transparencies; (2) detailed land use data interpreted at a scale of 1:24,000 from enlargement color prints of high altitude RB-57 photography; and (3) general soils map interpreted at a scale of 1:250,000 from false color enlargement prints of ERTS-1 color composite transparencies. In addition to use of imagery as an interpretation aid, the utility of using photographs as base maps was demonstrated. Author

N75-19808*# MRC Corp., Baltimore, Md.
AIRBORNE FOREST FIRE RESEARCH
G. Samuel Mattingly [1974] 18 p refs
(Contract NAS1-13047)
(NASA-CR-132630) Avail: NTIS HC $3.25 CSCL 02F

The research relating to airborne fire fighting systems is reviewed to provide NASA/Langley Research Center with current information on the use of aircraft in forest fire operations, and to identify research requirements for future operations. A literature survey, interview of forest fire service personnel, analysis and synthesis of data from research reports and independent conclusions, and recommendations for future NASA-LRC programs are included. Author

N75-19809# Oak Ridge National Lab., Tenn.
SYMCON: A PROGRAM FOR CONVERTING LATITUDE AND LONGITUDE TO ORTHOGONAL COORDINATES
R. L. Stephenson Oct. 1974 38 p refs
(Contract W-7405-eng-26)
(ORNL-NSF-EP-76) Avail: NTIS HC $3.75

The program, SYMCON, has been written to convert from latitude and longitude to distances, x and y, in inches as they would be found on a map of specified scale in any of several projections. The primary use of the program is to provide a convenient source of input data for the graphic display program SYMAP. Author (NSA)

N75-19810# Geological Survey, Reston, Va. Office of International Geology.
THE SHAELIAN ZONE REMOTE SENSING SEMINAR/WORKSHOP W. Africa Investigations, Final
Maurice J. Grolier, Raymond W. Fary, Jr., and Stephen J. Gawarecki Mar. 1974 32 p Conf. held in Bamako, Mali, W. Africa, 17-28 Apr. 1973 Sponsored in part by Agency for Intern. Develop., Washington, D. C.
(PB-236657/3; IR-WA-3) Avail: NTIS HC $3.75 CSCL 05I

A 1973 workshop and seminar on remote sensing to be held April 17 to 28th 1973 in Bamako, Mali, is reported. Thirty-five scientists and management personnel from nine countries and nine commissions participated. Subjects were ERTS experiment data acquisition and processing, the EROS program, and applications of ERTS data in cartography, geology, geography, hydrology, agriculture, and forestry. The report gives critiques by staff and students and a brief account of activities in U.S. and Mali preparatory to conduction of the course. GRA

N75-19811# Army Foreign Science and Technology Center, Charlottesville, Va.
ALL-UNION CONFERENCE ON THE AUTOMATION OF CARTOGRAPHY
A. V. Borodin 20 Mar. 1974 9 p Transl. into English from Geod. i Kartografiya (USSR), no. 7, 1972 p 66-67
(AD-A001471; FSTC-HT-23-1561-73) Avail: NTIS CSCL 08/2

The conference is reviewed. Automated methods for increasing production were emphasized. F.O.S.

N75-19812# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
PHYSICAL BIOLOGICAL AND CHEMISTRY INVENTORY OF TWENTY-THREE SIDE CHANNELS AND FOUR RIVER BORDER AREAS, MIDDLE MISSISSIPPI RIVER Final Report
William P. Emge, R. Charles Solomon, Jeffrey H. Johnson, C. Rex Bingham, and Billy K. Colbert Oct. 1974 166 p refs
(AD-A000608; AEWES-Misc-Paper-Y-74-5) Avail: NTIS CSCL 06/6

This report is one of nine reference sources to be used for the preparation of an Environmental Impact Statement (EIS) by the U.S. Army Engineer District, St. Louis. Twenty-three side channels were sampled in June and August 1972 and 13 of the 23 side channels and 4 river border areas were sampled in July 1973. Physicochemical parameters sampled were dissolved oxygen, temperature, turbidity, pH, and alkalinity. Biological elements sampled were plankton, benthos, and fish. Meteorologi-

cal parameters included wind velocity, cloud cover, and ambient air temperature. Other physical parameters measured were bottom sediments and discharges. Methods and materials used to gather data are described. This report includes the physical, biological, and chemical raw data, a consolidation of data for each sampling area, and a brief summation of the results for each area. No attempt was made to correlate data among sampling areas. Another WES report will include an overall assessment of the aquatic data. (Modified author abstract) GRA

N75-19813# Bureau of Mines, Morgantown, W.Va. Process Evaluation Group (MRED).
AN ECONOMIC ANALYSIS OF OIL SHALE OPERATIONS FEATURING GAS COMBUSTION RETORTING Technical Progress Report
Sidney Katell and Paul Wellman Oct. 1974 22 p
(PB-237851/1; BM-TPR-81) Avail: NTIS HC $3.25 CSCL 0 I

The economics of producing a high-quality, semirefined shale oil (Syncrude) from oil shale are discussed. Options for Syncrude production, 50,000 and 100,000 barrels per calendar day, with an integrated system of underground mining, above ground processing, and waste handling are presented. GRA

N75-19814# Science Communication, Inc., McLean, Va.
INTRA INDUSTRY CAPABILITY TO SUBSTITUTE FUELS Final Report
Oct. 1974 150 p
(Contract FEA-C-03-50034-00)
(PB-237605/1; FEA/EI-50034) Avail: NTIS HC $5.75 CSCL 21D

The main purpose of this study was to identify the economic potential for substituting coal as a fossil fuel for oil or natural gas in meeting the fuel needs of the manufacturing sectors. The major objective of the study was to define the amounts of petroleum-based fuels that could be replaced, the conditions or incentives required for their replacement, and the degree to which replacement would be accomplished by the time-line years 1977, 1980, 1985 and 1990. GRA

N75-19815# Brock (Robert H., Jr.) Inc., Camillus, N.Y.
PHOTOMETRIC EVALUATION OF SENSORS Final Report, May 1972 - Jun. 1974
Robert H. Brock, Jr. Oct. 1974 128 p refs
(Contract F30602-72-C-0449)
(AD-A002150; RADC-TR-74-256) Avail: NTIS CSCL 08/2

The report reviews the procedures used by the Rome Air Development Center during the past several years for the photogrammetric evaluation of sensors. They are described and evaluated with respect to their accuracy, cost-effectiveness, and ease of implementation. Two basic systems were evaluated: a ground-based PC-1000 camera system and an airborne camera system. In each case the general capability of the camera is considered, the calibration of the camera system is discussed, and actual tests with each system were completed and analyzed. GRA

N75-19816# Army Foreign Science and Technology Center, Charlottesville, Va.
FIFTY YEARS OF GEODETIC, PHOTOGRAMMETRIC AND CARTOGRAPHIC LITERATURE IN THE USSR
S. A. Salysev 29 Aug. 1974 19 p Transl. into ENGLISH from Geod. Kartografiya (USSR), v. 12, 1972 p 68-73
(AD-A002716; FSTC-HT-23-0216-74) Avail: NTIS CSCL 08/2

The article presents a historical survey of all publications on geodesy, cartography, photogrammetry and aerial surveying published in the Soviet Union in the last fifty years. GRA

N75-19817# Naval Oceanographic Office, Washington, D.C.
PRELIMINARY RESULTS OF LITTLE WINDOW 2: A SATELLITE OCEAN STATION EXPERIMENT IN THE GULF OF CALIFORNIA Final Report
Paul E. Laviolette, ed. Apr. 1974 100 p refs Presented at an Interagency Conf. held in Apr. 1972
(AD-A002457; NOO-SP-261) Avail: NTIS CSCL 08/10

In May 1971, a joint United States-Mexican experiment was conducted in a 200-by-200-km square in the Gulf of California to compare NOAA 1 satellite equivalent blackbody temperatures (TBB) from the NOAA 1 satellite with similar data collected by research vessels and aircraft. This experiment - LITTLE WINDOW 2 - was performed to determine the utility of satellite TBB sensors to define sea surface temperature features from space. Three specially equipped research aircraft and two survey vessels repeatedly ran oceanographic transects of the Gulf, while three Mexican naval vessels simultaneously occupied anchor stations at three corners of the LITTLE WINDOW 2 area. Report covers meteorological and oceanographic conditions, aircraft data analysis, and analyses of satellite data. GRA

N75-19818# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
PROBLEMS OF CRYOLITHOLOGY
A. I. Popov Oct. 1974 150 p refs Transl. into ENGLISH from the book "Problemy Kriolitologii" Moscow, Moscow Univ. Press, 1972 p 1-146
(AD-A002575; CRREL-TL-433) Avail: NTIS CSCL 08/7

The present second volume of collected articles Problems of Cryolithology deals with regional and theoretical questions of cryolithogenesis. Several articles deal with various problems of cryolithogenesis, features of thermokarst development in the area of the Primorskiy Lowland, and other phenomena of congelation litogenesis. One article discusses the relief forming activity of river ice. All the geologic processes in the upper part of the earth's crust, caused cryosphere-type effect are studied by cryolithogy. GRA

N75-19819# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
INTERAGENCY CONFERENCE ON COORDINATION OF RESEARCH ACTIVITIES, TOPIC STATEMENTS
Nov. 1973 281 p Conf. held at Vicksburg, Miss., 13-15 Nov. 1973
(AD-A002565) Avail: NTIS CSCL 13/2

The conference included Bonneville Power Administration, Corps of Engineers, Tennessee Valley Authority, and the Bureau of Reclamation as participating members. The objectives of the conference were the review of research in water resources, flood control, and related technical areas to prevent duplication of effort. GRA

N75-19820# Army Foreign Science and Technology Center, Charlottesville, Va.
DESERT, WATER, SUN
V. Rybin Jan. 1974 13 p Transl. into ENGLISH from Sotsialisticheskaya Industriya (USSR) v. 96, no. 180, Apr. 1973 p 4
(AD-A002644; FSTC-HT-23-1884-73) Avail: NTIS CSCL 08/6

The following articles are discussed. The Key to Life which discusses experiments in collecting water in the desert for irrigation; The Sea of Hope is the story of Nadezhda Shevchenko, a young hydrogeologist and her discovery of a source of underground water in Western Turkmenia; Energy is Free is an article about experiments in solar energy being done in the desert in Turkmenia; Miracle Canal tells about the construction and maintenance problems of the Kara Kum Canal. GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N75-19821*# Kanner (Leo) Associates, Redwood City, Calif.
WIND MOTORS: THEORY, CONSTRUCTION, ASSEMBLY

AND USE IN DRAWING WATER AND GENERATING ELECTRICITY
R. Champly Washington NASA Apr. 1975 253 p refs Transl. into ENGLISH from the book "Theorie, construction, montage, utilisation au puisage de l'eau a la production de l'electricite" Paris, Dunod Publ., 1973 270 p
(Contract NASw-2481)
(NASA-TT-F-16201) Avail: NTIS HC $8.50 CSCL 10A

A brief history of windmills is given. Various models are described, with discussions of their pros and cons, especially in regard to number of blades and method of orientation to the wind. Systems for transmission of power from the wind motor to a pump, generator, or other type of equipment are described. A method for computing the tension and compression stresses on the wind motor pylon is given and the construction of pylons and water tanks is discussed. Foundation and anchoring systems are described, as are several methods for assembling and raising the wind motor on its pylon. Systems using wind motors to draw and elevate water by means of pumps and systems using wind motors in conjunction with generators, storage batteries, etc., to generate electricity are described. Efficiency tables and comparative cost price tables are provided for each of these applications. Author

N75-19822*# Naval Ammunition Depot, Crane, Ind. Weapons Quality Engineering Center.
EVALUATION PROGRAM FOR SECONDARY SPACECRAFT CELLS
J. D. Harkness 10 Jan. 1975 282 p refs
(NASA Order S-53742AG)
(NASA-CR-142374; WQEC/C-75-2) Avail: NTIS HC $8.75 CSCL 10C

The cycle life tests to determine the performance capabilities of packs of cells under different loads and temperature conditions are reported. Results are summarized, and the failure of 14 failed cells is analyzed. It was found that the main cause of failure was separator deterioration and migration of the negative plate material. F.O.S.

N75-19823*# Boeing Aerospace Co., Kennedy Space Center, Fla. Field Operations and Support Div.
RISK MANAGEMENT TECHNIQUE FOR DESIGN AND OPERATION OF LIQUEFIED NATURAL GAS FACILITIES AND EQUIPMENT Final Report, Jun. - Dec. 1974
Clyde A. Medkief, Jr., Arthur W. Niergarth, and William N. Parsons 31 Dec. 1974 229 p refs
(Contract NAS10-7200)
(NASA-CR-139183) Avail: NTIS HC $7.50 CSCL 13L

A risk management and facilities certification methodology applicable to liquid natural gas facilities is developed. The proposed 'regulation for manufacture, storage, transportation, delivery, and processing of liquefied gas' prepared by the New York Fire Department was reviewed along with related codes and standards, and applicable experience in the operation of cryogenic facilities. Recommendations for revision are given. A basic description of the system is provided and general guidelines to be followed by the owner of a facility in supporting NYFD Risk Management are included. Working level descriptions of the basic concepts, the step-by-step instructions for preparing the data to be handled, and the procedures for status reporting and control are presented. Preliminary automated data processing requirements are included to support management information and control system planning. The RMS can be implemented in a manual mode and operated to establish the basic requirements and then matched to the data processing capability of the Fire Department for the most effective operation. J.M.S.

N75-19824# Japan Atomic Energy Research Inst., Tokyo.
PRODUCTION OF HYDROGEN FROM WATER USING NUCLEAR ENERGY. A REVIEW
R. Ueda, H. Tagawa, S. Sato, T. Yasuno, S. Ohno, and Mitsuru Maeda Mar. 1974 69 p refs In JAPANESE; ENGLISH summary
(JAERI-M-5642) Avail: ERDA Depository Libraries

Hydrogen, which is inexhaustible in the form of water, can be substituted for petroleum-based fuels and natural gas. Nuclear energy is the primary energy source for decomposing water. Information available for the production of hydrogen from water is reviewed. The following are described: (1) thermodynamics in the decomposition of water-one-step and multistep processes; (2) thermochemical decomposition process-description of MARK, GE, ANL and EOS processes; (3) nuclear energy as heat source and thermal efficiency in MARK 1 process; (4) radiolysis of water and carbon dioxide; and (5) photolysis of water. Author (NSA)

N75-19825# Sandia Labs., Albuquerque, N.Mex.
IN SITU OIL SHALE CONVERSION AND RECOVERY
H. M. Stoller Sep. 1974 10 p
(Contract AT(29-1)-789)
(SLA-74-0162) Avail: NTIS HC $3.25

The oil shale deposits of the western United States are estimated. In situ conversion and recovery techniques are discussed which will increase the amount of reserves which can be exploited, reduce the need for underground mining, and diminish the associated environmental disturbances and water requirements. Emphasis is placed on the development of remote techniques for the establishment of adequate permeability in the oil shale beds as well as the optimization and control of the conversion process. Author (NSA)

N75-19826# Sandia Labs., Albuquerque, N.Mex.
CHARACTERISTICS AND DEVELOPMENT OF THE TC-765 THERMAL BATTERY
C. O. Weaver Sep. 1974 21 p refs
(Contract AT(29-1)-789)
(SAND-74-0041) Avail: NTIS HC $3.25

This report presents the design intent, product characteristics, and development history of the TC-765 thermal battery. Author (NSA)

N75-19827# California Univ., Livermore. Lawrence Livermore Lab.
LLL-SOHIO SOLAR PROCESS HEAT PROJECT
W. C. Dickinson 1 Nov. 1974 6 p refs
(Contract W-7405-eng-48)
(UCID-16630-74-1; Rept-1) Avail: NTIS HC $3.25

The Sohio uranium plant will require about 500 gpm of water at 140 F, 24 hr/day. This preliminary report outlines a method for providing 50% or more of this requirement using solar energy. A fuel oil boiler will provide the balance. Estimated yearly savings amount to 22,000 bbl of oil and $80,000. Experimental prototypes are being built and tested. The completed system is expected to be operational by September 1, 1976. Future reports will consider various aspects of the project more specifically. Author (NSA)

N75-19828# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Reaktorentwicklung.
NUCLEAR DISTRICT-HEATING AND NUCLEAR LONG-DISTANCE ENERGY
T. Bohn, G. Dietrich, K. Kugeler, M. Kugeler, H. F. Niessen, and H. V. Schlenker Jun. 1974 68 p refs In GERMAN; ENGLISH summary
(JUL-1077) Avail: ERDA Depository Libraries HC $6.50

A survey is given about the possibilities of nuclear energy for heating of residential and industrial buildings. The costs and quantities are only a rough estimate. The results show that nuclear energy will have economical advantages in comparison with conventional systems for district-heating. Nuclear District-Heating is a contribution to relieve the environment of pollution, by using waste heat of electricity producing processes as is Nuclear Long-Distance Energy with its decentralized electricity production. Author (NSA)

N75-19829# Argonne National Lab., Ill.
DEVELOPMENT OF LITHIUM/SULFUR CELLS FOR APPLICATION TO ELECTRIC AUTOMOBILES
E. C. Gay, W. W. Schert, E. J. Martino, and K. E. Anderson 1974 26 p refs Presented at the 9th Intersoc. Energy Conversion Conf., San Francisco, 26 Aug. 1974 Sponsored by ERDA
(Conf-740805-7) Avail: NTIS HC $3.75

Development efforts on cells of the type Li/LiCl-KCl/FeS2 are reported, where negative electrodes containing liquid lithium alloys or solid lithium-aluminum alloys and positive electrodes containing iron sulfide, electrolyte, and current collector were

investigated. Lithium sulfide was added to sulfur electrode mixtures for improved cell performance. Electrodes were developed which meet the capacity density requirements for cells of the bicell configuration in a battery for electric automobile propulsion. A high percentage of the theoretical capacity density was measured in these cells with solid LiAl electrodes. A short-time peak power density of up to 1.4 W/sq cm was measured for liquid lithium electrodes with a charge cutoff voltage of 2.4 V IR-included. A power density greater than 0.6 W/sq cm was sustained for up to 55 sec. An operating lifetime of over 2000 hr and a cycle life of over 200 cycles were measured. Author (NSA)

N75-19830# California Univ., Livermore. Lawrence Livermore Lab.

FRACTURE-INDUCED PERMEABILITY: PRESENT SITUATION AND PROSPECTS FOR COAL

D. R. Stephens 20 Sep. 1974 23 p refs

(Contract W-7405-eng-48)

(UCID-16593) Avail: NTIS HC $3.25

Creation of permeability by explosive fracturing is considered. Permeability data correlate well with R/R sub c, where R sub c is the cavity radius, or with failure shear strain. Simultaneous detonations are quantitatively predicted to produce much flatter permeability distributions than for single or sequential detonation. The projected permeability distribution for HE fracturing by chemical explosives emplaced in an array of drilled holes has serious consequences for the LLL in situ coal gasification concept. Realistic gasification calculations are needed to indicate whether the predicted permeability distributions are acceptable or whether modifications or alternate solutions must be found.

Author (NSA)

N75-19831# Brookhaven National Lab., Upton, N.Y. Dept. of Applied Science.

ENERGY SYSTEMS ANALYSIS AND TECHNOLOGY ASSESSMENT PROGRAM Annual Report, fiscal year 1974

K. C. Hoffman and M. Beller Jun. 1974 345 p refs Sponsored by ERDA

(BNL-18984) Avail: NTIS HC $9.50

The second annual progress report describes the overall objectives of the program and a summary of the major activities during 1974. The highlights of the program include the development of the energy model data base and associated manipulative computer programs, the completion of a series of technology assessments, and a study of an intensive electrification strategy. Individual assessments of thirty energy technologies were performed in support of the formulation by the AEC chairman of a $10 billion national energy research and development program. Strategic planning scenarios were prepared. The intensive electrification study involved an evaluation of the substitution of coal and nuclear electric power for imported oil in the 1985 and 2000 time periods. The analytical techniques or models that were developed and are employed in the program are the reference energy system and the Brookhaven energy system optimization model. NSA

N75-19832# Sandia Labs., Albuquerque, N.Mex.

SIZING OF FOCUSED SOLAR COLLECTOR FIELDS WITH SPECIFIED COLLECTOR TUBE INLET TEMPERATURE

D. O. Lee, W. P. Schimmel, Jr., and J. P. Abbin, Jr. 1974 43 p refs Presented at Winter Meeting of the Am. Soc. of Mech. Engr., New York, 17 Nov. 1974 Sponsored by ERDA

(SLA-74-5288; Conf-741104-2) Avail: NTIS HC $3.75

An axial temperature differential analysis was used to size the collector field required to power a demonstration project in which 40 kW (electrical) output is required. The number of collectors required to furnish the desired energy and temperature rise in the collector fluid is determined by the requirements of several typical organic working fluid Rankine-cycle energy conversion systems. Calculations based on heliostatically-mounted collector systems and fixed tilt east-west tracking collector systems are presented. The collector matrix sizes obtained by these calculations are somewhat optimistic because the effects of wind losses and shadowing by adjacent collectors are not considered. No losses are considered for connections between collectors. Losses in the Rankine cycle power conversion loop are considered. This analysis is thus valid for a lossless, infinitely spaced collector field. Author (NSA)

N75-19833# Continental Oil Co., Houston, Tex.

PROJECT RIO BLANCO DATA REPORT: PRODUCTION TESTING (RB-E-01), NOVEMBER 1973 AND JANUARY - FEBRUARY 1974

Sep. 1974 96 p Sponsored by ERDA

(NVO-148) Avail: NTIS HC $4.75

Project Rio Blanco is a government-industry gas reservoir stimulation experiment using three 30-kiloton nuclear explosives, which were detonated simultaneously in a single well, RB-E-01, at depths of 5,838.5, 6,229.7, and 6,689.5 feet. After completion of reentry drilling, initial drawdown testing was performed in two phases: the first phase was conducted during November, 1973, and the second phase during January-February, 1974. Production of approximately 300 million cubic feet of gas had been planned, but a total of only 98 million (dry gas) was produced. Furthermore, most, if not all, of the gas produced came from the top chimney because there is apparently no significant evidence of communication between the top and the two lower chimneys. The testing of the entire secion was therefore considered inconclusive and alternate reentry operations began in May, 1974. Data obtained during the November, 1973, and January-February, 1974, testing periods are presented. NSA

N75-19834# Royal Aircraft Establishment, Farnborough (England).

THE PROSPERO SOLAR CELL EXPERIMENTS

F. C. Treble Jun. 1974 20 p refs Presented at the 10th IEEE Photovoltaic Specialists Conf., Palo Alto, Calif., Nov. 1973

(RAE-TR-74061; BR41995) Avail: NTIS HC $3.25

Data from the solar cell experiments on the Prospero technological satellite are presented and discussed. The space worthiness and radiation resistance of very thin flexibly-mounted silicon cells is demonstrated along with the superiority of ceria-stabilized glass over fused silicon as a coverslip material. The accuracy of performance and radiation damage predictions based on terrestrial measurements is established. The photon degradation effect in float zone silicon of high dislocation density is confirmed by the behavior of the heavily pre-irradiated cells in the coverslip experiment. The effect was not evident in the thin cells which were not pre-irradiated. Author (ESRO)

N75-19835# Philco-Ford Corp., Palo Alto, Calif. Western Development Labs. Div.

REAL TIME ASSESSMENT OF IMPROVED LITHIUM-DOPED SOLAR CELLS Final Report

Donald C. Briggs, Howard E. Pollard, and Darryl G. Peterson Jul. 1974 228 p refs

(Contract F33615-73-C-2016; AF Proj. 3145)

(AD-A000451; AFAPL-TR-74-55) Avail: NTIS CSCL 10/2

Lithium-doped silicon solar cells were irradiated at an accelerated real-time rate, with a Strontium-90 radioisotope simulating the trapped electron environment. The irradiation was performed for a one-year period in a simulated space environment. Three advanced types of lithium cells and two types of conventional N/P cells were controlled to temperatures typical of normal oriented solar array satellite operational conditions. At the six-month point, the cells were exposed to a pulsed neutron environment simulating a nuclear weapon detonation. The experiment was successful in providing high quality data characterizing the comparative performance of several solar cell types. The experimental program demonstrated the advantages obtained by using recent production lithium-doped solar cells for spacecraft missions requiring nuclear hardening. The feasibility of designing and producing solar arrays using aluminum contact lithium-doped solar cells has been shown to have definite advantages for arrays subjected to neutron environments. (Modified author abstract) GRA

N75-19836# Rensselaer Polytechnic Inst., Troy, N.Y.

ELECTROCHEMICAL POWER SOURCES Final Technical Report, 18 Sep. 1968 - 31 Jan. 1974

David A. Aikens and Howard Littman Sep. 1974 87 p refs

(Contract DAAB07-69-C-0063; DA Proj. 1T6-62705-A-053)

(AD-A001610; ECOM-69-0063-F) Avail: NTIS CSCL 07/4

The report summarizes research in the areas of electrodes and electrolytes and heat and mass transfer in porous media. Heats of solution were determined for alkali metal salts in nitrile solvents and the structure of electrolytes - nitrile solutions has

been studied by Raman spectroscopy and conductance. Data on non-aqueous electrolytes has been compiled. Properties of reference electrodes and liquid junctions in propylene carbonate have been studied potentiometrically and the problem of uncompensated resistance has been studied by electrostatic methods. The effect of cycling on sealed Ni-Cd batteries has been studied. Liquid-gas distribution in porous media has been studied by modeling techniques and by gamma scattering. The coupling of thermal and mass transport with electrochemical processes at the three phase interface has been studied using a microelectrode, and theoretical studies of evaporation from thin films have been performed. GRA

N75-19837# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
ANALYSIS OF A COOLING CONCEPT FOR HIGH-DISCHARGE-RATE PILE TYPE BATTERIES Technical Report, Mar. - Sep. 1973
David H. Fritts Jul. 1974 40 p
(AF Proj. 3145)
(AD-A000417; AFAPL-TR-10) Avail: NTIS CSCL 10/3

The report presents a feasibility analysis of an internal cooling technique for pile-type batteries. A first-order thermal analysis is done for a battery design which uses internal heat sinks placed directly between the battery cell stacks. The heat sink contains a phase-change material and is specifically designed to permit a continuous electrical current path between cell stacks in the pile. A more accurate solution (higher order) may be attempted if experiment indicates the current results are inadequate. The problems of fabricating such cooling devices are not addressed here but an analysis of their performance is. The equations derived are not difficult to use in designing the cooling devices. This cooling technique is attractive for high current density pile-type batteries, particularly where an external heat sink approach is not wanted. Author (GRA)

N75-19838# Kellogg (M. W.) Co., Houston, Tex.
A SASOL TYPE PROCESS FOR GASOLINE, METHANOL, SNG, AND LOW-BTU GAS FROM COAL Final Report
F. K. Chan Jul. 1974 90 p refs
(Contract EPA-68-02-1308)
(PB-237670/5; EPA-650/2-74-072) Avail: NTIS HC $4.75 CSCL 07A

Costs and feasibility of manufacturing gasoline, methanol, SNG, and low Btu gas from coal using the SASOL-type process are assessed. This process is based on a SASOL plant which has been operated commercially for more than 20 years for the manufacture of gasoline, fertilizers, and other chemicals from coal in South Africa. The SASOL plant has been modified slightly to suit the product spectrum of the projected plants. Capital investments for plants producing various end products are estimates based on published or in-house information on a mine-mouth plant using Western U.S. coal. The capital investment is expressed in 1975 dollars with no forward escalation. GRA

N75-19839# Pittsburg and Midway Coal Mining Co., Kansas City, Mo.
DEVELOPMENT OF A PROCESS FOR PRODUCING AN ASHLESS LOW SULFUR FUEL FROM COAL VOLUME 4. PRODUCT STUDIES. PART 2. ANNOTATED BIBLIOGRAPHY ON MINERAL FIBER PRODUCTION FROM COAL MINERALS Interim Report, Jun. 1969
Nov. 1974 71 p Prepared in cooperation with Washington State Univ., Pullman 5 Vol.
(Contract DI-14-01-0001-496)
(PB-237763/8; OCR-53-INT-10-Vol-4-Pt-2) Avail: NTIS HC $4.75 CSCL 07A

The literature search performed in support of research on mineral fiber production from the residual solids of the Solvent Refined Coal (SRC) Process is summarized. GRA

N75-19840# Pittsburg and Midway Coal Mining Co., Kansas City, Mo.
DEVELOPMENT OF A PROCESS FOR PRODUCING AN ASHLESS, LOW-SULFUR FUEL FROM COAL VOLUME 4. PRODUCT STUDIES. PART 3 PRODUCTS FROM COAL MINERALS Interim Report, Jun. 1972
Nov. 1974 51 p refs Prepared in cooperation with Washington State Univ., Pullman 5 Vol.
(Contract DI-14-01-0001-496)
(PB-237764/6; OCR-53-INT-11-Vol-4-Pt-3) Avail: NTIS HC $4.25 CSCL 07A

Feasibility of producing products from mineral residue of the Solvent Refined Coal(SRC) Process is discussed. Experimental studies included the processing of sulfur, iron, and the production of mineral wool. A review of the experimental procedure and results is given. GRA

N75-19841# Pittsburg and Midway Coal Mining Co., Kansas City, Mo.
DEVELOPMENT OF A PROCESS FOR PRODUCING AN ASHLESS, LOW-SULFUR FUEL FROM COAL VOLUME 4. PRODUCT STUDIES. PART 4. SULFUR REMOVAL FROM COAL MINERALS Interim Report, Jun. 1972
Nov. 1974 40 p refs Prepared in cooperation with Washington State Univ., Pullman 5 Vol.
(Contract DI-14-01-0001-496)
(PB-237765/3; OCR-54-INT-12-Vol-4-Pt-4) Avail: NTIS HC $3.75 CSCL 07A

Sulfur removal from residual solids of the Solvent Refined Coal (SRC) Process is investigated. The residue, called coal minerals, contains various amounts of ferrous oxide, silica, carbon, and alumina. The preferential oxidation technique for sulfur removal was tested on the coal mineral for the oxidation of ferrous sulfide. The process is reviewed and results are reported. GRA

N75-19842# Pittsburg and Midway Coal Mining Co., Kansas City, Mo.
DEVELOPMENT OF A PROCESS FOR PRODUCING AN ASHLESS, LOW-SULFUR FUEL FROM COAL VOLUME 4. PRODUCT STUDIES. PART 5. DEVELOPMENTAL AND RATE STUDIES IN PROCESSING OF COAL MINERALS Ph.D. Thesis Interim Report, Jun. 1973
Nov. 1974 139 p refs Prepared in cooperation with Washington State Univ., Pullman 5 Vol.
(Contract DI-14-01-0001-496)
(PB-237766/1; OCR-53-INT-13-Vol-4-Pt-5) Avail: NTIS HC $5.75 CSCL 07A

Processing of coal minerals from the Solvent Refined Coal (SRC) Process is discussed. The report reviews the chemical reactions and kinetics of carbon gasification for the production of fuel as synthesis gas and subsequent recovery of elemental iron and sulfur. GRA

N75-19843# Dynatech R/D Co., Cambridge, Mass.
FUEL GAS PRODUCTION FROM SOLID WASTE Semiannual Progress Report, 1 Jan. - 30 Jun. 1974
R. G. Kispert, L. C. Anderson, D. H. Walker, S. E. Sadek, and D. L. Wise 31 Jul. 1974 183 p
(Contract NSF C-827)
(PB-238068/1; NSF-RA-N-74-111) Avail: NTIS HC $7.00 CSCL 13B

A comprehensive computer model of a waste digestion plant was developed. Equipment, size, and processing conditions were selected for producing fuel gas at minimum cost on a scale representative of municipal waste generation. The values of operating and cost parameters were extensively verified and documented. A sensitivity study was applied to the cost calculations to determine the effect of variations from base-line conditions. The economic computations indicate that gas may be produced from solid waste by anaerobic digestion at an acceptable cost. GRA

N75-19844# Honeywell, Inc., Horsham, Pa. Power Sources Center.
LITHIUM RESERVE BATTERY Final Report, Feb. 1972 - Jun. 1974
Robert J. Horning, W. Keith Gallant, and Walter B. Ebner 25 Jul. 1974 369 p
(Contract DAAA21-72-C-0437)
(AD-A001674) Avail: NTIS CSCL 10/3

The purpose of the contract was to design, develop and deliver a complete Lithium Organic Electrolyte Reserve Battery including activation mechanism to an initial specified configuration. An amendment to the scope of work was added to the contract to determine the causes for stability of a particular electrolyte

formulation and also to generate material specifications that will sufficiently describe and control the important characteristics of the electrolyte and constituent materials. The choice of electrolyte was based in part on the results obtained from comprehensive studies concerning the high temperature stability of 2M LiAsF6/MF electrolyte solutions. It was found that the addition of small amounts of LiBF4 to these solutions greatly increased their high temperature storage capabilities. It was determined that the LiBF4 was effective only when lithium metal was also present in the solution. LiBF4 was able to stabilize solutions prepared with grades of LiAsF6 obtained from other vendors but to a much lesser degree. GRA

N75-19845# GTE Labs., Inc., Waltham, Mass.
SEALED LITHIUM INORGANIC ELECTROLYTE CELL Quarterly Report, 1 Jun. - 31 Aug. 1974
N. Marincic and A. Lombardi Nov. 1974 25 p refs
(Contract DAAB07-74-C-0108; DA Proj. 1S7-62705-AH-94)
(AD-A001756; ECOM-74-0108-2; QR-2) Avail: NTIS CSCL 10/3

Work was continued during the second quarter on investigating the operating characteristics of lithium/thionyl chloride cells, as well as on the evaluation of cell compounds to be used in building D-size cells. The pressure build-up in sealed cells on discharge was investigated over a wide range of discharge rates. It was established that no gas is generated in the cell at the discharge rate of 1.5 mA/sq cm of electrode. A steady, low-rate gassing at higher rates of discharge is related to the total capacity obtained, and independent of discharge rate in a fairly wide range of current densities, as long as the voltage of the cell remains above approximately 1.5V. A different type of gas is generated in the cell at the end of discharge and at a much higher rate. This gas redesolves in the electrolyte soon after the discharge is terminated, leaving behind only the noncondensible gas formed at discharge at a higher operating voltage. Three kinds of battery cathodes were evaluated during this period. The design calculations were made, predicting the maximum capacity and the rate capability of D-size cells made with these cathodes. GRA

N75-19846# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A SURVEY OF THE DIFFERENT METHODS OF TRAPPING IONIZED ADDITIVE ON THE EXPERIMENTAL MHD INSTALLATION U-02
E. G. Apukhtina, V. V. Bordacheva, A. Yu. Valdberg, E. A. Vikhrov, and V. P. Kurkin 4 Nov. 1974 28 p refs Transl. into ENGLISH from Magnito-Gidrodinamicheskii Metod Polucheniya Elektroenergii (USSR), no. 3, 1972 p 202-219
(AD-A001858; FTD-MT-24-1641-74) Avail: NTIS CSCL 10/2

A bag filter system for the removal of the additives from the MHD circuit is described along with a turbulent washer for the 'wet' removal of the additives. A wet electrofilter system is also described. F.O.S.

N75-19847# Minnesota Mining and Mfg. Co., St. Paul.
MANPORTABLE THERMOELECTRIC GENERATOR Final Report, Apr. 1973 - Aug. 1974
K. Magnuson, E. Pitcher, and P. Stroom Nov. 1974 42 p refs
(Contract DAAB07-73-C-0138; DA Proj. 1S7-62705-AH-94)
(AD-A002042; ECOM-73-0138-F) Avail: NTIS CSCL 10/2

The report describes the design, fabrication, and test of the 120 Watt Manportable Thermoelectric Generator (exploratory development model). This portable device is comprised of five functional subsystems: thermoelectric converter, liquid fuel burner, electronics circuitry, fuel system, and cooling system. Two experimental generators were built and evaluated. The test results show that the system operates on all liquid fuels, ranging from gasoline to diesel oil (DF-1) and that it has potential as a portable, 120-Watt, generator for Army field use. GRA

N75-19848# Honeywell, Inc., Horsham, Pa. Power Sources Center.
MANUFACTURE OF LITHIUM RESERVE CELLS Final Technical Report, Mar. 1973 - Apr. 1974
Robert J. Horning and Kurt F. Garoutte Jul. 1974 142 p refs
(Contract DAAA21-73-C-0677)
(AD-A002075) Avail: NTIS CSCL 10/3

The manufacture of 1200 lithium reserve cells was accomplished within this contract. The cells manufactured conformed to Picatinny Arsenal P/N T9275567 with the exception that the case material was type 316L stainless steel and the electrolyte was of the formulation 2M LiAsF6 (U.S.S) - 0.4M LiBF4/MF. Two difficulties were encountered and corrected during the course of this program. The first, a failure of the anode electrode which was subsequently reconfigured to eliminate occurrence thereafter. The second more significant problem involved the integrity of the glass-to-metal seal in the terminal plate of the cell. Investigation found the seal was developing fine leaks as a result of thermal stresses encountered during the final weld sealing of the cell. The seal problem was corrected and cell deliveries resumed. GRA

N75-19849# Heliotek, Sylmar, Calif.
HIGH ENERGY DENSITY SINTERED PLATE TYPE NICKEL-CADMIUM BATTERY CELLS. PART 1: THE POSITIVE ELECTRODE/PLAQUE RELATIONSHIP Interim Report, Dec. 1972 - Dec. 1973
H. N. Seiger, D. F. Pickett, V. J. Puglisi, P. F. Ritterman, and R. L. Oliver Aug. 1974 23 p refs
(Contract F33615-73-C-2012)
(AD-A000103/2; AFAPL-TR-74-56-Pt-1) Avail: NTIS HC $3.25 CSCL 10/3

Progress is reported on work performed toward the development of a 20 watt-hours per pound and 2 watts-hour per cubic inch nickel-cadmium battery cell. The relationship between nickel sinters and nickel hydroxide active material necessary to achieve these goals is described. A theory on utilization of active material is presented. Data are given showing an optimum porosity exists. A hypothesis is given to account for blistering and thickening of nickel hydroxide electrodes. Author (GRA)

N75-19850# Heliotek, Sylmar, Calif.
HIGH ENERGY DENSITY SINTERED PLATE TYPE NICKEL-CADMIUM BATTERY CELLS. PART 2: ELECTROCHEMICAL IMPREGNATION METHODS TO PRODUCE NICKEL OXIDE ELECTRODES Technical Report, Dec. 1972 - Dec. 1973
D. F. Pickett, V. J. Puglisi, H. N. Seiger, and R. L. Oliver Aug. 1974 36 p refs
(Contract F33615-73-C-2012)
(AD-A002142; AFAPL-TR-74-56-Pt-2) Avail: NTIS CSCL 10/3

A pilot plant operation for producing nickel hydroxide electrodes for use in satellite battery cells is described. Reproducibility, loading level dependence on process time, formation procedure and degree of plate swelling as a function of loading level are discussed. Analytical procedures for both electrode and impregnation solution are given. The process offers considerable savings in time over conventional processes with remarkable electrode reproducibility. GRA

N75-19851# Eagle-Picher Industries, Inc., Colorado Springs, Colo. Precision Products Dept.
VENTED NICKEL CADMIUM BATTERY ASSEMBLY, BB-651( )/U Final Report, Jun. 1973 - Nov. 1974
James Hill Nov. 1974 103 p
(Contract DAAB07-73-C-0258)
(AD-A002566; ECOM-0258-F) Avail: NTIS CSCL 10/3

The object of this contract was the design, development and testing of lightweight improved nickel-cadmium battery assembly BB-651( )/U. This battery assembly is a military-ruggedized design consisting of four monoblocks each containing five cells. A lightweight acrylonitrile butadiene styrene case was developed. The battery assembly is rated 24 volts and 5.5 ampere-hours or 12 volts and 11 ampere hours. This multiple voltage arrangement is possible as a result of the ECOM connector arrangement. The assembly was designed and tested. The environmental tests included vibration, bounce and a four foot drop on each corner, edge and face. Thirty batteries were shipped to USAECOM upon successful completion of the testing. This final report outlines the design and development program and fully documents the battery assembly design. GRA

N75-19852# Argonne Universities Association, Ill. Chemical Engineering Div.
EVALUATION OF ELECTROLYTES FOR DIRECT OXIDATION HYDROCARBON/AIR FUEL CELLS Interim Report, Jan. - Dec. 1973
John P. Ackerman and Robert K. Steunenberg Nov. 1974 32 p refs
(DA Proj. 1T6-61102-A-34)
(AD-A002578) Avail: NTIS CSCL 10/3

Several candidate electrolytes for hydrocarbon/air fuel cells were selected on the basis of probable low adsorption, chemical and electrochemical stability, low volatility, low toxicity, etc. A Teflon kell and electrolyte pump were designed and constructed for use at 140C. Hexafluorophosphoric acid was found to be chemically unstable in the presence of water. Trifluoro methane sulfonic acid monohydrate showed promise but wet Teflon bonded electrodes. Solid polymer electrolyte and bistrifluoromethylphosphonic acid and pentadecafluorooctanoic acid will be tested at a later date. GRA

N75-19853# Army Foreign Science and Technology Center, Charlottesville, Va.
THERMIONIC CONVERSION
25 Feb. 1974 6 p Transl. into ENGLISH from Komsomolskaya Pravda (USSR), no. 213, 1972
(AD-A002639; FSTC-HT-23-1822-73) Avail: NTIS CSCL 10/2

The role of thermionic reactors is discussed. Topaz type prototypes have been tested in the Soviet Union with quite satisfactory results. It is hoped that, in the next few years, they will be used in spacecraft and save millions of dollars in the space program. GRA

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N75-19854# National Center for Scientific, Technical and Economic Information, Warsaw (Poland). Foreign Scientific Publications Dept.
AIR CONSERVATION
1974 79 p refs Transl. into ENGLISH from Ochr. Powietrza (Poland), v. 5, no. 4(24), 1971 79 p Sponsored by EPA and NSF
(TT-72-54022/4) Avail: NTIS HC $4.75

Various papers on air pollution and pollution control techniques and devices are presented. Emphasis is placed on reduction of exhaust gases from industrial sources. For individual titles, see N75-19855 through N75-19860.

N75-19855 National Center for Scientific, Technical and Economic Information, Warsaw (Poland).
SOME ASPECTS OF THE ENVIRONMENT POLLUTION CONTROL
J. Sibiga *In its* Air Conserv. (TT-72-54022/4) 1974 p 1-8 Transl. into ENGLISH from Ochr. Powietrza (Poland), v. 5, no. 4(24), 1971 6 p (For availability see N75-19854 11-45)

The importance of the natural environment of man was discussed. Air, water, and soil pollution were considered and the menace resulting from their constant growth was stressed. The means and methods of the refuse treatment used up to now were described indicating how the change in the refuse composition affects the techniques of its treatment. Emphasis is placed on the necessity of international collaboration in the field of the natural environment pollution control. Author

N75-19856 National Center for Scientific, Technical and Economic Information, Warsaw (Poland).
THE QUALITY COEFFICIENTS OF THE FABRIC AIR FILTERS
J. Juda and S. Chrosciel *In its* Air Conserv. (TT-72-54022/4) 1974 p 9-18 Transl. into ENGLISH from Ochr. Powietrza (Poland), v. 5, no. 4(24), 1971 10 p (For availability see N75-19854 11-45)

Characteristic quantities for fabric filters are treated. The mathematical form of the comparative coefficients and of quality coefficients for this type of filters is proposed. The coefficients derived are discussed and the values of characteristic quantities are compared for ten fabric filters. Performance of the filters is difficult for estimation. Author

N75-19857 National Center for Scientific, Technical and Economic Information, Warsaw (Poland).
AGROBIOLOGICAL PURIFICATION OF THE ATMOSPHERE AND OF THE SOIL IN THE NITROGEN AND SULFUR INDUSTRIES
J. Siuta *In its* Air Conserv. (TT-72-54022/4) 1974 p 19-33 Transl. into ENGLISH from Ochr. Powietrza (Poland), v. 5, no. 4(24), 1971 15 p Presented at Franco-Polish Symp., Warsaw, Oct. 1970 (For availability see N75-19854 11-45)

The sanitary and economic benefits of correct soil cultivation in the environment of industrial plants are described. The range of the agrobiological purification of the atmosphere and of the soil is analyzed and a detailed scope of the necessary integrated research is discussed. Author

N75-19858 National Center for Scientific, Technical and Economic Information, Warsaw (Poland).
FLY ASH FOR THE MANUFACTURE OF A HYDRAULIC LIME-CEMENT
S. Marcinkowski and S. Babinski *In its* Air Conserv. (TT-72-54022/4) 1974 p 34-40 refs Transl. into ENGLISH from Ochr. Powietrza (Poland), v. 5, no. 4(24), 1971 7 p (For availability see N75-19854 11-45)

The potential use of fly ash, which is collected in dust precipitators of power plants, for the manufacture of a hydraulic lime-gypsum cement is discussed along with pozzolanic activity of fly ash. Author

N75-19859 National Center for Scientific, Technical and Economic Information, Warsaw (Poland).
EMISSION ABATEMENT PROJECT FOR THE IRON AND STEEL INDUSTRY
S. Hamerlak *In its* Air Conserv. (TT-72-54022/4) 1974 p 41-45 refs Transl. into ENGLISH from Ochr. Powietrza (Poland), v. 5, no. 4(24), 1971 5 p Presented at Franco-Polish Symp., Warsaw, Oct. 1970 (For availability see N75-19854 11-45)

The methods and exhaust gas control equipment for emissions from the fundamental metallurgical processes in the iron and steel industry are reviewed. An integrated project aimed at maximum emission abatement is described, which includes the construction of an exhaust gas control equipment, and technological changes wherever the manufacturing process does not allow the exhaust gases to be reasonably handled, or when improvement of the process drastically reduces emission. J.M.S.

N75-19860 National Center for Scientific, Technical and Economic Information, Warsaw (Poland).
CATALYTIC PURIFICATION OF THE ATMOSPHERIC AIR
B. Glowiak and K. Syczewska *In its* Air Conserv. (TT-72-54022/4) 1974 p 46-53 refs Transl. into ENGLISH from Ochr. Powietrza (Poland), v. 5, no. 4(24), 1971 8 p Presented at Franco-Polish Symp., Warsaw, Oct. 1970 (For availability see N75-19854 11-45)

Studies on catalytic oxidation of hydrocarbon vapors are described, in which Cu/Zn catalysts were used. The catalysts developed constitute an active agent deposited on a solid support that ensures a low resistance to flow. Author

N75-19861# National Center for Scientific, Technical and Economic Information, Warsaw (Poland). Foreign Scientific Publications Dept.
AIR CONSERVATION
1974 71 p refs Transl. into ENGLISH from Ochr. Powietrza (Poland), v. 5, no. 6(26), 1971 81 p Sponsored by EPA and NSF
(TT-72-54022/6) HC $4.75

Air pollution from industrial plants is discussed. Atmospheric contamination and techniques for limiting and controlling this problem is described. For individual titles, see N75-19862 through N75-19866.

N75-19862 National Center for Scientific, Technical and Economic Information, Warsaw (Poland).
A POSSIBILITY OF SUPPLYING POWER TO THE ELECTRO-FILTERS FOR POWER BOILERS BY MEANS OF ELECTRIC IMPULSES
J. Poloczek and A. Zembok *In its* Air Conserv. (TT-72-54022/6) 1974 p 1-5 Transl. into ENGLISH from Ochr. Powietrza (Poland), v. 5, no. 6(26), 1971 5 p Presented at Polish-French Symp., Warsaw, Oct. 1970 (For availability see N75-19861 11-45)

Reasons reducing the efficiency of operation of the electrofilters removing dust from the flue gases leaving boilers fired with low-calorific bituminous coal, and possibilities of improving their efficiency, e.g. by impulse power supply, are discussed. The conditions which should be fulfilled by this system of power supply are also given. Author

N75-19863 National Center for Scientific, Technical and Economic Information, Warsaw (Poland).
INDICES OF EMISSION OF POLLUTANTS TO THE ATMOSPHERE FROM THE ROLLING MILLS OF IRON AND STEEL WORKS
J. Wasilewska and U. Krause *In its* Air Conserv. (TT-72-54022/6) 1974 p 6-10 refs Transl. into ENGLISH from Ochr. Powietrza (Poland), v. 5, no. 6(26) 1971 5 p (For availability see N75-19861 11-45)

Measurements and calculations are reported of dust and SO2 emission to the atmosphere from five rolling mills of iron and steel works. The indices of emission of these pollutions were given in kg/tons of rolled products. Author

N75-19864 National Center for Scientific, Technical and Economic Information, Warsaw (Poland).
RESULTS OF INVESTIGATION ON REDUCTION OF SO2 EMISSION TO THE ATMOSPHERE AT THE WITKOWICE STEEL WORKS
L. Svidrnoch and O. Poruba *In its* Air Conserv. (TT-72-54022/6) 1974 p 11-22 Transl. into ENGLISH from Ochr. Powietrza (Poland), v. 5, no. 6(26), 1971 12 p (For availability see N75-19861 11-45)

Experiments with the Venturi washer used for desulfurization of the combustion gases from a boiler fired with a fuel oil (sulfur content amounting to 2.6%) are described. Although the adequately low temperatures of water were not maintained, the efficiency of desulfurization amounted to 60-70%. Tests on the desulfurization of combustion gases from a tandem furnace were also carried out. The behavior of construction materials in the atmosphere of gases containing SO2 was studied. Desulfurization costs are given. Author

N75-19865 National Center for Scientific, Technical and Economic Information, Warsaw (Poland).
ATMOSPHERIC CONTAMINATION WITH HYDROGEN CYANIDE FROM BLAST FURNACE GAS PURIFICATION PLANTS
Z. Pociecha *In its* Air Conserv. (TT-72-54022/6) 1974 p 23-41 refs Transl. into ENGLISH from Ochr. Powietrza (Poland), v. 5, no. 6(26), 1971 19 p (For availability see N75-19861 11-45)

The effluents from blast furnace gas purification plants contain considerable concentrations of simple cyanides. It was found that the simple cyanides undergo an intensive hydrolysis in an aqueous solution. The effect of solution temperature, pH, initial concentration of cyanides in a solution and of ventilation number upon the degree of atmospheric pollution by the desorbed hydrogen cyanide is presented. On the basis of semitechnical and industrial tests it was proved that the atmospheric contamination with desorbed hydrogen cyanide considerably exceeds the standards adopted. Author

N75-19866 National Center for Scientific, Technical and Economic Information, Warsaw (Poland).
FORMATION OF THE PROFILE OF GAS VELOCITY AND DUST CONCENTRATION OF GAS IN PIPES
E. Ryszka *In its* Air Conserv. (TT-72-54022/6) 1974 p 42-57 refs Transl. into ENGLISH from Ochr. Powietrza (Poland), v. 5, no. 6(26), 1971 14 p Presented at Polish-French Symp., Warsaw, Oct. 1970 (For availability see N75-19861 11-45)

The problem of distribution of gas velocity and dust concentration of a gas in pipes is discussed. Attention is called to the fact that the profiles of gas velocity and dust concentration in the industrial pipes are, as a rule, non-stabilized. On the basis of the author's own experiments, the formation of gas velocity and dust concentration profiles is analyzed by means of Venturi tubes. It has been found that due to the installation of Venturi tubes, the profiles of gas velocity and dust concentration can be formed and compared by means of adequate criterions. The profiles formed in this way can be used for dust removal from gas and for automatic measurements of dust concentration. Author

N75-19867# California Univ., Livermore. Lawrence Livermore Lab.
ENVIRONMENTAL ASPECTS OF METHANOL AS VEHICULAR FUEL: HEALTH AND ENVIRONMENTAL EFFECTS
B. J. Berger 25 Sep. 1974 15 p refs Presented at the Eng. Found. Conf., Henniker, N.H., 7-12 Jul. 1974 Sponsored by ERDA
(UCRL-76076; Conf-740727-3) Avail: NTIS HC $3.25

An attempt is made to summarize the environmental effects and health consequences that can be predicted as a result of the use of methanol as transportation fuel. The criteria necessary for this evaluation are: the relative effects of the new fuel as compared with gasoline; and a comprehensive study including automotive emissions and all aspects of fuel use including distribution, industrial exposure, consequences of miscellaneous home use as well as effect on terrestrial and aquatic ecosystems. Results are shown of exhaust analysis for hydrocarbons and aldehydes with methanol fuels. A toxicological comparison of methanol and gasoline is tabulated. NSA

N75-19868# Savannah River Ecology Lab., Aiken, S.C.
THERMAL ECOLOGY
J. W. Gibbons, ed. and R. R. Sharitz, ed. 1974 687 p refs Symp. held at Augusta, Ga., 3-5 May 1973
(Conf-730505) Avail: NTIS HC $15.25

The thermal ecology of bodies of water as affected by nuclear reactor wastes is examined. Data are given on physico-chemical phenomena, physiological ecology, thermal tolerance, and adaptation of the animals, fishes, and waterfowl of the immediate area. Studies were also made of population response, behavioral modifications, and productivity of life found in these areas. The diversity of life in the above setting was examined. E.H.W.

N75-19869# Oak Ridge Y-12 Plant, Tenn.
DETERMINATION OF ARSENIC AND SELENIUM IN SURFACE WATER BY ATOMIC ABSORPTION TO SUPPORT ENVIRONMENTAL MONITORING PROGRAMS
H. G. King and R. W. Morrow 4 Nov. 1974 14 p refs
(Contract W-7405-eng-26)
(Y-1956) Avail: NTIS HC $3.25

A method was developed for determining arsenic and selenium in surface water by atomic absorption. The two elements are hydrided in acidified water by sodium borohydride to form arsine and selenine gases, which are then passed into a low temperature argon/air/hydrogen flame for the atomic absorption measurement. A background correction is made by adjusting the gas flow rates. The limit of detection is 5 micro g/1 for arsenic and 1 micron g/1 for selenium. The method is both fast and economical. Author (NSA)

N75-19870# Pennsylvania State Univ., University Park. Center for Air Environment Studies.
SOURCES AND NATURAL REMOVAL PROCESSES FOR SOME ATMOSPHERIC POLLUTANTS
Karen H. Rasmussen, Robert L. Kabel, and Mansoor Taheri Jun. 1974 130 p refs
(Grant EPA-R-800397)
(PB-237168/0; CAES-Pub-367-74; EPA-650/4-74-032) Avail: NTIS HC $5.75 CSCL 13B

The review attempts to briefly illustrate what the 'state of the art' is in the recognition of the various sources and natural sinks of gaseous pollutants. The removal mechanisms include absorption by vegetation, soil, rock and water bodies, precipitation scavenging, and chemical reactions within the atmosphere. The nature and magnitude of anthropogenic and natural emissions of the gases considered (H2S, SO2, N2O, NO, NO2, NH3, CO, O3, and hydrocarbons), along with their ambient background

concentrations and information on their major sinks identified to date, are discussed. In the case of sulfurous and nitrogenous compounds, this information has been used to prepare total geochemical cycles. GRA

N75-19871# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
AIR QUALITY DATA. 1973 FIRST QUARTER STATISTICS
May 1974 103 p refs
(PB-237545/9; EPA-450/2-74-007) Avail: NTIS HC $5.25 CSCL 13B

Ambient air quality data resulting from air monitoring operations of state, local, and federal networks is reported. These data represent all ambient air quality data sampled for pollutants that currently have national ambient air quality standards. They are particulate matter, sulfur oxides, carbon monoxide, nitrogen dioxide, photochemical oxidants, and hydrocarbons. GRA

N75-19872# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
AIR QUALITY DATA: 1973 SECOND QUARTER STATISTICS
May 1974 94 p refs
(PB-237598/8; EPA-450/2-74-010) Avail: NTIS HC $4.75 CSCL 13B

For abstract see, N75-19871.

N75-19873# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
AIR QUALITY DATA: 1973 THIRD QUARTER STATISTICS
May 1974 136 p refs
(PB-237599/6; EPA-450/2-74-011) Avail: NTIS HC $5.75 CSCL 13B

For abstract see, N75-19871.

N75-19874# Army Foreign Science and Technology Center, Charlottesville, Va.
FIELD STUDY ON AIR BASIN POLLUTION OF INDUSTRIAL CITIES
N. S. Burenin, B. B. Goroshko, and B. N. Pyantsev 5 Aug. 1974 15 p refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ., Leningrad. (USSR), no. 234, 1968
(AD-A002721; FSTC-HT-23-0861-74) Avail: NTIS CSCL 13/2

Operational principles for investigating pollution in urban air basins are discussed. A typical long-term study of such pollution for two cities is presented and includes an analysis of the yearly variation of such contaminants as sulfur dioxide, carbon monoxide, phenol, together with discussions of the effects of meteorological conditions on pollution. A short-term study of the pollution of one city in the Ukraine is also presented. GRA

N75-19875# Naval Civil Engineering Lab., Port Hueneme, Calif.
THE FATE OF SPILLED NAVY DISTILLATE FUEL Final Report, Jul. 1972 - Jun. 1973
Peter J. Hearst Sep. 1974 32 p refs
(AD-A002256; CEL-TN-1353) Avail: NTIS CSCL 13/2

Laboratory weathering studies of four Navy distillate fuels on salt water showed that in thick films (5 mm) the major portions of the oils did not evaporate in one week. These fuels are thus relatively persistent oils. The physical properties did not change markedly and the thick emulsion, or mousse, obtained with Navy special fuel oil was not obtained with the distillate fuels. Very thin films (0.1 mm) evaporated much more rapidly, leaving residues of about 5%, whereas Navy special fuel oil left residues of 65%. The weathering characteristics are related to the distillation range as shown by gas chromatographic comparisons. GRA

N75-19876# National Center for Scientific, Technical and Economic Information, Warsaw (Poland).
DEVELOPMENT OF A LOW EMISSION COMBUSTION SYSTEM FOR THE MERDC 10kW TURBO-ALTERNATOR Final Report
E. B. Zwick and R. D. Bottos May 1974 135 p
(Contract DAAK02-73-X-0001)
(AD-A001730; FR-2) Avail: NTIS CSCL 21/5

This report covers the first phase of a program to demonstrate the feasibility of a low emission combustion system for the MERDC 10 kW Turbo Alternator. Emissions for the Turbo Alternator with its original burner were found to be very high. Emissions from the Turbo Alternator with a special Zwick Burner were decreased to very low values. Typical results are shown. GRA

N75-19877# Naval Research Lab., Washington, D.C.
THE NRL ATMOSPHERE: TRENDS IN AIR QUALITY
Aristides Stamulis Oct. 1974 29 p refs
(AD-A002192; NRL-MR-2902) Avail: NTIS CSCL 13/2

The air pollutants currently being measured at the NRL air monitoring station are methane, carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, and total hydrocarbons. The trends in the concentrations of these pollutants are explained by the meteorological conditions and the pollution emission sources at or near the Laboratory. The use of the wind rose is explained as a useful device in determining the concentration values due to wind speed and wind direction. The seriousness of temperature inversions are explained and their role in increased concentrations of pollutants are described. The situation is considered important since 85 temperature inversions were recorded at NRL during a 12-month period. The minimum, maximum, and average range of the six pollutants are given. GRA

N75-19878# Air Force Weapons Lab., Kirtland AFB, N.Mex.
USAF AIRCRAFT TAKEOFF LENGTH DISTANCES AND CLIMBOUT PROFILES Final Report, 1 Jun. 1973 - 15 Sep. 1974
David F. Menicucci Oct. 1974 35 p ref
(AD-A001826; AFWL-TR-74-279) Avail: NTIS CSCL 13/2

The Air Force Weapons Laboratory in cooperation with the Argonne National Laboratory has developed a computerized Air Quality Assessment Model (AQAM) which will be used to assess the impact of airbase activity on Ambient Air Quality within the airbase and in surrounding areas. The AQAM has the capability of precisely simulating the aerial and ground operating cycle of each active USAF aircraft. An important component of this operating cycle is the takeoff runway roll distance. The runway roll is associated with high engine power settings and correspondingly high pollution emissions. This report outlines the procedure for utilizing least-squares curve fitting techniques to develop equations to accurately define the runway roll distance for each USAF aircraft in given meteorological conditions. GRA

N75-19879# Esso Research and Engineering Co., Linden, N.J. Government Research Lab.
EVALUATION OF POLLUTION CONTROL IN FOSSIL FUEL CONVERSION PROCESSESS, GASIFICATION. SECTION 1: SYNTHANE PROCESS Final Report
C. D. Kalfadelis and E. M. Magee Jun. 1974 93 p refs
(Contract EPA-68-02-0629)
(PB-237113/6; GRU-4DJ-74; EPA-650/2-74-009-b) Avail: NTIS HC $4.75 CSCL 13B

Results of a review of the U.S. Bureau of Mines Synthane Coal Gasification Process are given from the standpoint of its potential for affecting the environment. The quantities of solid, liquid, and gaseous effluents are estimated as well as the thermal efficiency of the process. A number of possible process modifications or alternates are proposed, and new technology needs are discussed. GRA

N75-19880# Exxon Research and Engineering Co., Linden, N.J.
EVALUATION OF POLLUTION CONTROL IN FOSSIL FUEL CONVERSION PROCESSES: GASIFICATION. SECTION 1: LURGI PROCESS Final Report
H. Shaw Jul. 1974 77 p refs
(Contract EPA-68-02-0629)
(PB-237694/5; GRU-5DJ-74; EPA-650/2-74-009-C) Avail: NTIS HC $4.75 CSCL 13B

A process analysis of the Lurgi Dry Ash Gasification Process for high Btu gas was carried out. The process is reviewed from the standpoint of its potential for affecting the environment. The waste stream compositions were calculated for a 250 MM scfd synthetic natural gas plant using a subbituminous coal. Thus,

the quantities of solid, liquid, and gaseous pollutants were estimated, where possible. The thermal efficiency for various process alternatives was calculated. A number of process modifications which would reduce pollution and/or increase thermal efficiency were suggested. The technology needs to control pollution were assessed. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N75-19881 Colorado State Univ., Fort Collins.
A COMPARISON OF THE STRUCTURE AND FLOW CHARACTERISTICS OF THE UPPER TROPOSHERE AND STRATOSPHERE OF THE NORTHERN AND SOUTHERN HEMISPHERES Ph.D. Thesis
Robert Frederick Adler 1974 160 p
Avail: Univ. Microfilms Order No. 74-27935

The general circulations of the Northern and Southern Hemispheres are compared with regard to the upper troposphere and stratosphere using atmospheric structure obtained from satellite, multi-channel radiance data. Specifically, the data are from the satellite infrared spectrometer (SIRS) instrument aboard the Nimbus 3 spacecraft. The inter-hemispheric comparisons are based on two months of data (one summer month and one winter month) in each hemisphere. The mean meridional circulation of the Southern Hemisphere stratosphere in winter is studied using zonally-averaged vertical motion fields calculated by a heat budget technique. The mean pattern for July 1969 shows two main cells with the polar night jet stream associated with an indirect cell. There are shown to be significant variations in the horizontal eddy heat flux and vertical motion patterns in the Southern Hemisphere in relation to the presence or absence of a minor midwinter warming. Dissert. Abstr.

N75-19882 Pittsburgh Univ., Pa.
OBSERVATIONS FROM THE ORBITING GEOPHYSICAL OBSERVATORY 6 OF MESOSPHERIC AIRGLOW AND SCATTERING LAYERS Ph.D. Thesis
Bruce William Guenther 1974 98 p
Avail: Univ. Microfilms Order No. 74-26822

Data obtained from an horizon scanning photometer flown onboard the Orbiting Geophysical Observatory-6 are presented. The photometer had a field of 7.5' of arc in the vertical, to yield an extremely fine altitude resolution (usually 6 km or less) through the region about the mesopause near 95 km. Interference filters, one centered near 557.7 nm designed to detect the O('S)-O('D) atomic oxygen emission, and one centered near 589.3 nm designed to detect the resonance radiation from free atomic sodium, were alternately displayed between a telescope and a photomultiplier tube. Several latitude profiles of the maximum integrated slant emission rate of 557.7 and 589.0-589.6 nm nightglow are presented, showing generally an oscillatory behavior for both lines, with a generally anticorrelative amplitude. The green line of atomic oxygen near 97 km in the mesosphere shows a strong tendency for a relatively deep trough at low latitudes near the equator. Sodium day airglow, known to emit in a narrow layer about 92 km, was investigated. Several plots of sodium dayglow brightness displayed against latitude are presented. At high latitudes, during local summers, a narrow but bright particle scattering layer was detected. Dissert. Abstr.

N75-19883 Minnesota Univ., Minneapolis.
MEASUREMENT OF LOW FREQENCY MAGNETIC FLUCTUATIONS IN THE MAGNETOSPHERE Ph.D. Thesis
Bodo Knuth Parady 1974 265 p
Avail: Univ. Microfilms Order No. 74-26223

An overview of magnetospheric physics and plasma wave theory is presented. The construction of the Siple micropulsation detector is detailed which provides data from waves of periods of .1-1000 seconds with a maximum sensitivity of .2 m gammas. Some preliminary observations from this detector are presented showing instances of Pcl and Pil. Results from the Explorer 45 search coil experiment describe the behavior of plasmaspheric hiss for the first nine months of operation. Results indicate that hiss becomes most intense during the recovery of the storm and moves inward. There is an association of hiss with proton events on orbits 99 and 101, and the statistical study shows that hiss is more intense on the dayside than the nightside. Anisotropic proton instability hiss is presented as a generation mechanism for plasmaspheric hiss which predicts that hiss will be generated in a band about the local lower hybrid resonance frequency. Dissert. Abstr.

N75-19884# National Center for Atmospheric Research, Boulder, Colo. Atmospheric Quality and Modification Div.
MODIFICATION OF AEROSOL SIZE DISTRIBUTIONS IN THE TROPOSPHERE
I. H. Blifford, J. W. Burgmeier (Vermont Univ.), and C. E. Junge (Max-Planck-Inst. fuer Chemie) Aug. 1974 71 p refs
(NCAR-TN/STR-98) Avail: NTIS HC $4.25

Computer modeling techniques are used to assess the importance of various processes which determine the size and number distribution of natural aerosols. The models used are based on quantitative formulations of the processes involved. The rate is determined at which, under atmospheric conditions, tropospheric aerosol distributions can change. Two typical tropospheric aerosol situations are studied: a boundary layer model and a tropospheric model. Results show that there is a relatively rapid reduction with time in the number of the smallest particles due to coagulation and that, sedimentation and attachment reduce the number of large particles at a lesser rate. J.M.S.

N75-19885# Joint Publications Research Service, Arlington, Va.
GEOPHYSICS
3 Mar. 1975 17 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 218, no. 3, 1974 p 570-575, 828-829
(JPRS-64223) Avail: NTIS HC $3.25

Data are reported on periodic winds in the tropical zone, effects of corpuscular radiation on atmospheric temperature in polar regions, and the vertical electrical component of geomagnetic pulsations over layered segments. For individual titles, see N75-19886 through N75-19888.

N75-19886 Joint Publications Research Service, Arlington, Va.
PERIODIC WINDS OF THE STRATOSPHERE AND LOWER MESOSPHERE IN THE TROPICAL ZONE
G. I. Golyshev, L. S. Minyushina, and A. Kh. Khrgian *In its* Geophysics (JPRS-64223) 3 Mar. 1975 p 1-5 refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 218, no. 3, 1974 p 570-572 (For availability see N75-19885 11-46)

Rocket observations were used to study wind distribution over the Atlantic Ocean on the Island of Voznesen'ye, Fort Sherman, Antigua, Grand Turk Island, and Cape Kennedy at latitudes of 20 to 60 km. A clear semi-annual cycle was observed above 35 km. Observations were made from 1960 to 1968. E.H.W.

N75-19887 Joint Publications Research Service, Arlington, Va.
THE CORPUSCULAR NATURE OF HEATING EFFECTS IN THE POLAR THERMOSPHERE
S. M. Poloskov, G. F. Tulinov, and M. L. Shanen *In its* Geophysics (JPRS-64223) 3 Mar. 1975 p 6-9 refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 218, no. 3, 1974 p 573-575 (For availability see N75-19885 11-46)

During the period of February to March 1970 a series of MR-12 meteorological rocket launchings was conducted on the Island of Heiss for the purpose of studying the temperature conditions in the upper atmosphere of the polar region. The temperature measurement was conducted with the aid of artificial noctilucent clouds by an absorption method. The data obtained indicate a variable character in the intensity of corpuscular streams. In comparing the results of the measurements a positive connection appeared between the temperature and the amount of corpuscular radiation: greater streams of particles correspond to the higher temperatures. In particular, at a maximal measured temperature of 750 K the greatest corpuscular stream was registered. Author

N75-19888 Joint Publications Research Service, Arlington, Va.
THE VERTICAL ELECTRICAL COMPONENT OF THE FIELD OF GEOMAGNETIC PULSATIONS
K. Yu. Zybin, S. M. Krylov, V. P. Lependin, V. A. Morgunov, V. A. Troitskaya, and D. N. Chetayev *In its* Geophysics (JPRS-64223) 3 Mar. 1975 p 10-14 refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 218, no. 3, 1974 p 828-829 (For availability see N75-19885 11-46)

The confirmation of predictions on the existence of the vertical electrical component over horizontally layered segments is reported. Predictions were made by analyzing amplitude-phase relationships of other components in the field of propagating geomagnetic pulsations. Author

N75-19889*# Illinois Univ., Urbana. Aeronomy Lab.
STUDIES OF THE DIFFERENTIAL ABSORPTION ROCKET EXPERIMENT
J. C. Ginther and L. G. Smith 15 Jan. 1975 96 p refs
(Grant NGR-14-005-181)
(NASA-CR-142344; UILU-ENG-75-2501; Aeronomy-64) Avail: NTIS HC $4.75 CSCL 04A

Investigations of the ionosphere, in the rocket program of the Aeronomy Laboratory, include a propagation experiment, the data from which may be analyzed in several modes. This report considers in detail the differential absorption experiment. The sources of error and limitations of sensitivity are discussed. Methods of enhancing the performance of the experiment are described. Some changes have been made in the system and the improvement demonstrated. Suggestions are made for further development of the experiment. Author

N75-19890*# Illinois Univ., Urbana. Aeronomy Lab.
AN EVALUATION OF THE PARTIAL REFLECTION TECHNIQUE AND RESULTS FROM THE WINTER 1971 - 1972 D REGION
L. C. Dasilva and S. A. Bowhill 1 Oct. 1974 251 p refs
(Grant NGR-14-005-181)
(NASA-CR-142352; UILU-ENG-74-2506; Aeronomy-63) Avail: NTIS HC $8.50 CSCL 04A

Fundamental physical and chemical processes, and measurement techniques on the D region are reviewed. Design considerations about a partial-reflection system are made, and the main characteristics of the partial-reflection system at the University of Illinois are presented. The nature of the partial reflections is discussed, particularly reflections produced by gradients in electron density and by random fluctuations in a locally homogeneous random medium. Possible reasons for disagreement between partial reflections and rocket measurements are discussed. Some suggestions are made to improve partial-reflection data reduction, including the use of only maximums of the reflections and deconvolution of the data. The results of partial-reflection measurements at Wallops Island, Virginia during the 1971-1972 winter are presented and compared to rocket measurements. Author

N75-19891*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GRAVITY TECTONICS AND SEISMIC GAPS IN THE MANTLE
Han-Shou Liu Jul. 1974 32 p refs Submitted for publication
(NASA-TM-X-70856; X-921-74-184) Avail: NTIS HC $3.75 CSCL 08K

The concept of gravity tectonics is applied to reveal the major clue as to the conditions which result in the correspondence of seismic and tectonic gaps in the mantle. An asymptotic theory is developed for the calculation of the thrust and moment when a descending lithospheric plate encounters resistance to its downward motion in the mesosphere. Dynamic analysis falls into two parts: (1) deriving equations for forces in the descending lithosphere, (2) deducing moment distribution which causes the detachment of lithosphere. For the analysis of forces a mathematical theory of shells is given. In order to determine the detachment mechanism, solutions of equations are obtained by asymptotic integration. It is found that a thrust N sub phi coupled with a moment M sub phi due to gravitational forces generated by density contrast may play a key role in the initial detachment of a piece of descending lithosphere. The results are in agreement with the observed seismic gaps beneath South America, Toga-Fiji, New Zealand and New Hebrides regions. Author

N75-19892# Kiruna Geophysical Inst. (Sweden).
KIRUNA GEOPHYSICAL DATA Data Summary, Oct. - Dec. 1974
G. Gustafsson, ed. Dec. 1974 69 p
Avail: NTIS HC $4.25

Results of ground-based measurements of upper atmosphere variables carried out at Kiruna Geophysical Institute are presented. Geophysical data, related to polar upper atmospheric conditions, is summarized for those who require it for research work. Author

N75-19893# Suomalainen Tiedeakatemia, Helsinki (Finland).
STUDY OF LATITUDINAL, DIURNAL AND SEASONAL VARIATION OF IONOSPHERIC ABSORPTION ACCORDING TO OBSERVATIONS OF THE RIOMETER NETWORK IN FINLAND
Hilkka Ranta and Aarne Ranta Dec. 1974 23 p refs
(Rept-13) Avail: NTIS HC $3.25

Riometer data from Finnish riometer stations are analyzed and the results compared with results from Norway, U.S.S.R., Alaska and Canada. Maximum absorption occurs at corrected geomagnetic latitudes 67 deg - 64 deg North. The diurnal variation of absorption at different latitudes is analyzed. Absorption has two maxima and one minimum at latitudes 62 deg - 77 deg North, none nightmaximum at latitudes > 77 deg North and one daymaximum at latitudes < 62 deg North. Alaskan results show that diurnal variation has only one clear daymaximum at all latitudes. Author

N75-19894*# National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.
ERROR ANALYSIS OF DOBSON SPECTROPHOTOMETER MEASUREMENTS OF THE TOTAL OZONE CONTENT
Alfred C. Holland and Richard W. L. Thomas (Wolf Res. and Development Corp., Riverdale, Md.) Washington Mar. 1975 30 p refs
(NASA-TN-D-7877) Avail: NTIS HC $3.75 CSCL 04A

A study of techniques for measuring atmospheric ozone is reported. This study represents the second phase of a program designed to improve techniques for the measurement of atmospheric ozone. This phase of the program studied the sensitivity of Dobson direct sun measurements and the ozone amounts inferred from those measurements to variation in the atmospheric temperature profile. The study used the plane - parallel Monte-Carlo model developed and tested under the initial phase of this program, and a series of standard model atmospheres. Author

N75-19895*# Kanner (Leo) Associates, Redwood City, Calif.
RELATION BETWEEN THE WIND AND PRESSURE FIELDS IN THE STRATOSPHERE AND LOWER MESOSPHERE OF THE TROPICAL REGION OF THE NORTHERN HEMISPHERE
L. S. Minyushina Washington NASA Mar. 1975 16 p refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 8, Aug. 1974 p 37-45
(Contract NASw-2481)
(NASA-TT-F-16224) Avail: NTIS HC $3.25 CSCL 04A

An analysis of the spatial and time profiles of the zonal wind field and contour charts of the 10 mb and 2 mb surfaces is presented. Variability of the pressure field in the quasi-biennial circulation cycle is compared with that in the semiannual cycle. Author

N75-19896# California Univ., Livermore. Lawrence Livermore Lab.
CONCEPT FOR AN ATMOSPHERIC RELEASE ADVISORY CAPABILITY
M. H. Dickerson, J. B. Knox, J. J. Cohen, and R. C. Orphan 2 Oct. 1974 16 p refs
(Contract W-7405-eng-48)
(UCRL-51656) Avail: NTIS HC $3.25

The purpose of this study is to develop a concept for an advisory service that could be used to assess the consequences of an accidental release of radioactivity or other toxic materials

to the atmosphere. This capability would be used in the form of advisories to AEC sites and facilities and eventually could be applied to licensee sites. The major theme of the proposed atmospheric release advisory capability is to provide estimates of the effects of atmospheric releases of hazardous materials as rapidly and accurately as possible. Author (NSA)

N75-19897# California Univ., Berkeley. Lawrence Berkeley Lab.
SUPERSONIC AIRCRAFT AND THE OZONE LAYER
H. S. Johnston May 1974 52 p refs
(Contract W-7405-eng-48)
(LBL-2748) Avail: NTIS HC $4.25

Model calculations including atmospheric motions and the photochemistry of oxygen, water, and nitrogen oxides indicate that 500 supersonic transports would reduce the stratospheric ozone shield between 3 and 30 percent. Stratospheric ozone has been observed to change with solar-cycle modulated cosmic rays, presumably by virtue of the nitric oxide produced. The ozone data for the period from 1960 to 70 are consistent with a small decrease and then increase of ozone associated with nitric oxide from nuclear-bomb tests. These observed changes of ozone with nitric oxide indicate a greater sensitivity of stratospheric ozone to nitric oxide than is given by most model calculations. Author (NSA)

N75-19898# California Univ., Livermore. Lawrence Livermore Lab.
ANALYSIS OF THE GROUND MOTION FROM RIO BLANCO
L. S. Germain 30 Sep. 1974 16 p refs
(Contract W-7405-eng-48)
(UCRL-51668) Avail: NTIS HC $3.25

Project Rio Blanco is a government-industry gas-reservoir stimulation experiment using three 30-kt (125-TJ) nuclear explosives detonated simultaneously in a single well bore, at depths of 1780, 1900, and 2040 m (5840, 6230, and 6690 ft). The detonation occurred at approximately 10:00 a.m. Mountain Day-light Time on May 17, 1973. As a part of the project, 36 locations were instrumented for ground motion by the U.S. Geological Survey/Seismic Engineering Branch. Data resulting from these measurements were published. In particular, distance, bearing, and peak amplitudes for acceleration, velocity, and displacement are given for each station. These data, and similar data from the other gas stimulation experiments, Gas-buggy and Rulison, are subjected to further analysis in this report.
Author (NSA)

N75-19899# California Univ., Livermore. Lawrence Livermore Lab.
ESTIMATED CLOSE-IN SURFACE MOTION FOR PROJECT RIO BLANCO
E. C. Jackson 26 Jun. 1972 11 p Sponsored by ERDA
(UCID-16071) Avail: NTIS HC $3.25

Surface ground motion for areas within five miles of the Rio Blanco Event is predicted. Empirical Methods for predicting this motion are described along with results. Author (NSA)

N75-19900# Louisiana State Univ., Baton Rouge. Dept. of Petroleum Engineering.
ANALOG SIMULATION OF ANISOTROPIC PERMEABILITY Ph.D. Thesis
Ronald E. Rinard May 1974 122 p refs
(PB-238037/6; OWRT-A-032-LA(1); W75-02357) Avail: NTIS HC $5.25 CSCL 08H

The magnitude of directional variance in permeability in the plane of bedding was expressed by the two-dimensional anisotropy ratio, A, defined as K sub max/K sub min. The use of a whole core permeameter was investigated to determine the anisotropy ratio and the principal values of permeability of a cylindrical core. An electrical analog device was used to simulate steady-state fluid flow through an anisotropic core fixed in a whole core permeameter. Simulation of anisotropic porous media was achieved by the construction of grid networks of conductive lines drawn on plastic drafting film. Investigated were the effects of anisotropy ratio, permeameter flow window size, and core orientation relative to the major permeability axis, on the pressure drop-flow rate response measured by the permeameter. GRA

N75-19901# Wisconsin Univ., Madison.
A COMPARISON OF RAKE-MEASURED SCATTERING LAYER SIGNATURES WITH RADIOSONDE DATA Final Report, Apr. 1972 - Jun. 1973
W. P. Birkemeir, A. B. Fontaine, K. S. Gage, and W. H. Jasperson Feb. 1974 126 p refs
(Contract F30602-72-C-0280; AF Proj. 4519)
(AD-A002156; RADC-TR-74-17) Avail: NTIS CSCL 17/2

RAKE soundings for ten days have been compared with meteorological soundings of the refractive index structure determined from radiosonde ascents near the common volume. Comparison of profiles of the refractive index structure function coefficient (C sup 2, sub n) with the received signal zero-Doppler power profile indicated more power was often received at certain heights than was predicted by (C sup 2, sub n). Layer angular dependence estimates at these heights made from the layers parabolic signatures in the scattering function showed evidence of anisotropy in the refractivity structure. It is shown by an anisotropic turbulence model that the anisotropy can account for the enhanced signal levels. GRA

N75-19902# Systems Science and Software, La Jolla, Calif.
NEAR FIELD SMALL EARTHQUAKE: COMPUTER SIMULATION Final Report
J. Theodore Cherry 31 Oct. 1974 45 p refs
(Contract F44620-72-C-0051; ARPA Order 2134)
(AD-A001923; SSS-R-75-2475; AFOSR-74-1800TR) Avail: NTIS CSCL 08/11

A three dimensional finite difference code is being developed which will perform a deterministic simulation of a stick slip earthquake. The primary goal of this research effort is to obtain an earthquake's equivalent elastic source in a form which is suitable for propagation to teleseismic distances. Normalization of the earthquake model to the near field data obtained at Bear Valley is expected to furnish the required validation of the model. GRA

N75-19903# San Calixto Observatory, La Paz (Bolivia).
RESEARCH IN SEISMOLOGY AND INFRASONIC ACOUSTIC WAVES Final Report, 15 Sep. 1971 - 30 Jun. 1974
Ramon Cabre Aug. 1974 93 p refs
(Grant AF-AFOSR-2177-72; AF Proj. 9751)
(AD-A001942; Pub-26; AFOSR-74-1879TR) Avail: NTIS CSCL 08/11

A microbarographic array of 7 sensors, a seismic station, and a meteorological station were maintained in operation, and data were used for research. An analog cheap computer was designed and constructed to analyze in-line signals arriving to the acoustic array. A punched card reader was added, and cable telemetry of two outposts was changed by UHF telemetry. An electronical spectral analyzer to operate in-line was designed. Upper level winds and generation of storms were studied. Different empirical methods of measuring yield of atmospheric nuclear explosions are introduced; they were applied to 8 French and to 3 Chinese explosions and results (compared with the ones of Pierce-Posey method) are shown. Optimum inlet configuration in a noise reducing array was sought, and coupling of seismic and atmospheric waves was measured for several phases of two distant earthquakes. Author

N75-19904# California Univ., Santa Barbara. Dept. of Physics.
SPECTROSCOPIC STUDIES OF ENERGY EXCHANGE PROCESSES OCCURRING IN THE UPPER ATMOSPHERE AND ROCKET EXHAUST PLUMES Final Report, 1 Sep. 1969 - 31 Aug. 1974
H. P. Broida 1974 17 p refs
(Grant AF-AFOSR-1851-70; AF Proj. 9750)
(AD-A001938; AFOSR-74-1787TR) Avail: NTIS CSCL 07/4

To obtain improved electromagnetic signal transmission for communication systems, it is necessary to have a detailed understanding of the chemistry and physics of the upper atmosphere and rocket exhaust plumes. Part of this understanding comes from the study of the kinetics of atomic and molecular collisions of excited chemical species. The report summarized the work done on this program whose objective has been to study gas phase kinetics through the use of unique optical spectroscopy techniques developed at the University of California,

Santa Barbara. Research has been focused on processes involving electronic and vibrationally excited states. Optical spectroscopy from 100 to 20,000 nm has been used to determine mechanisms and to measure rate constants and cross sections for several low energy collision processes and chemiluminescent reactions involving small molecules. GRA

N75-19905# Naval Research Lab., Washington, D.C.
COUPLED BARIUM CLOUD-IONOSPHERE SYSTEMS. 3: NEUTRAL WIND EFFECTS IN THE SMALL CLOUD APPROXIMATION
D. L. Book, S. L. Ossakow, and S. R. Goldman (Science Applications, Inc., McLean, Va.) Oct. 1974 15 p refs
(DNA Proj. NWED-QAXH)
(AD-A002191; NRL-MR-2890) Avail: NTIS CSCL 04/1

The nonlinear motion of a small F-region barium release electrostatically coupled to the E-region is studied in the presence of a neutral wind with differing values for the E- and F-regions. In a reference frame with the E-region neutral wind, an F-region neutral wind transverse to the background E sub 0 field is shown to retard or accelerate the evolution of the cloud without otherwise altering the development of the system. When the relative neutral wind has a component parallel to the background E sub 0 field, there is also a change in the direction of the axis of elongation of the cloud as a function of time, although the final direction is independent of the relative neutral wind. Barium cloud and image behavior are shown to be substantially identical for periodic and Dirichlet boundary conditions. GRA

N75-19906# West Indies Univ., Kingston (Jamaica). Dept. of Physics.
DYNAMICS OF THE MESOSPHERE AND LOWER THERMOSPHERE Final Report, 1 Jan. - 31 Jan. 1973
31 Dec. 1973 51 p refs
(Grant AF-AFOSR-2466-73)
(AD-A001906; SR-74; AFCRL-TR-74-0315) Avail: NTIS CSCL 04/1

The objective of the work described in this report was to make observations on the mesosphere and lower thermosphere using several different experimental techniques. The results obtained were then to be used to obtain a better understanding of the dynamics of the region. The techniques employed were: Meteor radar, laser radar, ionospheric soundings, and ionospheric drifts. The report describes the observations and the results obtained from each experiment. GRA

N75-19756 Joint Publications Research Service, Arlington, Va.
PECULIARITIES OF THE INTERRELATION OF THE PROCESSES OF SUMMER CIRCULATION IN THE STRATOSPHERE AND TROPOSPHERE AND AIR TEMPERATURE FORECASTING FOR THREE RUNNING FIVE-DAY PERIODS
Kh. Kh. Rafailova and L. P. Yemelyanova *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 23-32 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 21-28 (For availability see N75-19753 11-42)

N75-19757 Joint Publications Research Service, Arlington, Va.
FREQUENCY OF A CLEAR SKY OVER THE TERRITORY OF THE SOVIET UNION DURING DAYLIGHT HOURS
Sh. P. Darchiya, V. I. Ivanov, and P. G. Kovadlo *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 33-39 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 29-34 (For availability see N75-19753 11-42)

N75-19763 Joint Publications Research Service, Arlington, Va.
INTEGRAL CURRENT FUNCTION METHOD OF SOLVING THE PROBLEM OF THE WIND-DRIVEN CURRENT WITH SLIDING IN A STREAM
V. S. Sinelshchikov *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 82-92 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 70-77 (For availability see N75-19753 11-42)

N75-19764 Joint Publications Research Service, Arlington, Va.
A MECHANISM OF SOIL MOISTURE ACCUMULATION IN DESERTS
V. I. Vorobyev *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 93-99 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 78-82 (For availability see N75-19753 11-42)

N75-19767 Joint Publications Research Service, Arlington, Va.
COMPARISON OF THE SOVIET AND AMERICAN SYSTEMS OF SHIP RADIOSOUNDING OF THE ATMOSPHERE
K. I. Goltsova, O. V. Marfenko, M. A. Petrosyants, and V. D. Reshetov *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 114-124 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 92-97 (For availability see N75-19753 11-42)

N75-19770 Joint Publications Research Service, Arlington, Va.
STUDIES OF THE UPPER ATMOSPHERE BY MEANS OF MR-12 ROCKETS
Yu. F. Ivanov, V. P. Teslenko, A. A. Shidlovskiy, A. A. Fokin, V. A. Shchukin, and M. P. Arzhakov *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 146-150 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 109-111 (For availability see N75-19753 11-42)

N75-19771 Joint Publications Research Service, Arlington, Va.
GLOBAL ATMOSPHERIC RESEARCH PROGRAM (GARP)
Ye. P. Borisenkov *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 155-162 Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 114-117 (For availability see N75-19753 11-42)

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N75-19907# Washington Univ., Seattle.
DETERMINATION OF THE SURFACE STRESS USING THE VORTICITY EQUATION AND THE MASS BUDGET RESULTS FROM BOMEX (BARBADOS OCEANOGRAPHIC AND METEOROLOGICAL EXPERIMENT) DATA Ph.D. Thesis
Jason Kwock Sung Ching 1974 114 p
Avail: Univ. Microfilms Order No. 74-29390

The relationship was examined between the frictional torque and the mass divergence on a 500 km space scale on the basis of data collected during BOMEX. The various terms in the vorticity equation were computed and integrated throughout the PBL. By incorporating mass budget results computed independently, the bulk aerodynamic transfer coefficient for momentum was derived. The data used came from period 3 (June 22 to June 29, 1969), surface measurements taken from booms extended 10 meters forward of the bow as well as from rawins taken every 1.5 hours from each of the five ships in the BOMEX fixed array. A study showed the winds from the boom to be superior to those measured on the masts of the ships. Computations of this transfer coefficient were made on a daily and period average basis assuming that the vertical velocity at the top of the tropical planetary boundary layer is just that required to balance the vertically integrated vorticity budget within the PBL. Dissert. Abstr.

N75-19908 Wyoming Univ., Laramie.
BIOGENIC SOURCES OF ATMOSPHERIC ICE NUCLEI Ph.D. Thesis
Russell Clifford Schnell 1974 138 p
Avail: Univ. Microfilms Order No. 74-23704

Biogenic sources of freezing nuclei are investigated. It is found that copious numbers of freezing nuclei are found in decayed plant leaf litters collected in the Northern Hemisphere as well as in seawaters rich in phytoplankton. The ability of different types of biogenic nucleans to freeze supercooled drops upon contact is found to be the same as their ability to initiate freezing in suspension. The rates of release of freezing nuclei from litters in situ were determined experimentally. Atmospheric ice nucleus concentrations and freezing nucleus concentrations in rainfall are both shown to exhibit the same climatic dependence as is found in the availability of biogenic nuclei at the surface. This correlation

indicates that large proportions of atmospheric ice nuclei may be derived from biogenic sources. Dissert. Abstr.

N75-19909 Institut d'Aeronomie Spatiale de Belgique, Brussels.
METHOD FOR COMPUTATION OF STRATOSPHERIC INFRARED ABSORPTION SPECTRA [METHODES DE CALCUL DE SPECTRES STRATOSPHERIQUES D'ABSORPTION INFRAROUGE]
M. Maignan (Soc. Natl. d'Ind. Aerospatiales, Paris) and C. Muller 1974 17 p refs In FRENCH; ENGLISH summary Presented at the 2nd Joint Covos Comesa Seminar, Oxford, 24-26 Sep. 1974
(Aeronomica-Acta-A-132-1974) Avail: Issuing Activity

A method for the calculation of stratospheric infrared absorption spectra, based on numerical simulation, was developed. The specific properties of the spectra to be simulated, and the solution of the problem using an IBM 1800 or an IBM 370 computer are discussed. The validity of the approximations made and the application of the method to the processing of infrared spectral data are discussed. ESRO

N75-19910 + Centre National d'Etudes des Telecommunications, Issy-les-Moulineaux (France).
UPPER ATMOSPHERE WIND MEASUREMENTS BY MEANS OF METEOR RADARS Final Report [MESURE DES VENTS DANS LA HAUTE ATMOSPHERE AU MOYEN DE RADARS METEORIQUES]
M. Glass and A. Spizzichino Dec. 1973 17 p refs In FRENCH; ENGLISH summary
(Contract DGRST-70-02-172)
Avail: NTIS Avail: Issuing Activity

A portable meteor radar yielding measurements of the neutral wind in the 80-110 km altitude range was set up in Bragny-en-Charollais (46 deg North 3 deg east). The wind measurements were made over the same region observed by the Garchy meteor radar and thus values of both horizontal components of the neutral wind were given. The Garchy meteor radar was also made portable and a computer was joined in order to detect meteor echoes in real time. Simultaneous recording runs were performed and are being analyzed. Results obtained by the Garchy meteor radar permit a deeper analysis of the wind motion in the upper atmosphere including turbulence, gravity waves, tidal winds, planetary waves. Author (ESRO)

N75-19911# National Center for Atmospheric Research, Boulder, Colo.
WEATHER FORECASTING AND STORM ANALYSIS Annual Report, 1974
Oct. 1974 102 p refs
Avail: NTIS HC $5.25

Research highlights of 1973 to 1974 include studies on physical processes in the troposphere and stratosphere, development of realistic models of the atmosphere to permit weather forecasting, large scale meteorological data gathering and simulation experiments, and numerical experiments for global circulation modeling. G.G.

N75-19912*# City Coll. of the City Univ. of New York. Dept. of Earth and Planetary Sciences.
A 30-DAY FORECAST EXPERIMENT WITH THE GISS MODEL AND UPDATED SEA SURFACE TEMPERATURES
Jerome Spar, Robert Atlas, and Eugene Kuo Mar. 1975 35 p refs
(Grant NGR-33-013-086)
(NASA-CR-142315; Contrib-41) Avail: NTIS HC $3.75 CSCL 04B

The GISS model was used to compute two parallel global 30-day forecasts for the month January 1974. In one forecast, climatological January sea surface temperatures were used, while in the other observed sea temperatures were inserted and updated daily. A comparison of the two forecasts indicated no clear-cut beneficial effect of daily updating of sea surface temperatures. Despite the rapid decay of daily predictability, the model produced a 30-day mean forecast for January 1974 that was generally superior to persistence and climatology when evaluated over either the globe or the Northern Hemisphere, but not over smaller regions. Author

N75-19913*# Kanner (Leo) Associates, Redwood City, Calif.
RELATION BETWEEN SAND GRAINS ON RECLAIMED LAND OF SAND COAST AND WIND VELOCITY
Toramasa Chigusa and M. Akiba Washington NASA Feb. 1975 20 p Transl. into ENGLISH from Nogyo Doboku Kenkyu (Japan), v. 1, no. 1, 1929 p 31-40
(Contract NASw-2481)
(NASA-TT-F-16188) Avail: NTIS HC $3.25 CSCL 04B

The relation is discussed between wind force and sand grains, dealing with one aspect of a method for computing the number of days on which there is a movement of sand grains on the ground. Both wind drag and critical wind velocity play a role in the acceleration of sand grains. The angle of inclination of a sand dune is investigated by analogy with motion on an inclined plane. Author

N75-19914*# Kanner (Leo) Associates, Redwood City, Calif.
ATMOSPHERIC PROCESSES IN THE 30-60 km LAYER DURING 1971-1973
I. V. Bugayeva and L. A. Ryazanova Washington NASA Mar. 1975 18 p refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 8, Aug. 1974 p 46-55
(Contract NASw-2481)
(NASA-TT-F-16223) Avail: NTIS HC $3.25 CSCL 04B

Systematic, weekly, upper-air contour charts constructed from data obtained at rocket sounding stations in the Northern Hemisphere are discussed. These charts, which cover the period from August 1971 to December 1973 and describe the 35, 40, 45, 50, 55 and 60 km levels, are used to obtain information about processes in the upper stratosphere and lower mesosphere during the spring and autumn reversals and the winter anomalous warmings. It is shown that the dates of the spring reversal of the meteorological fields in the stratosphere depend on the phase of the quasi-biennial cycle and on the nature of the processes in the winter warmings. Author

N75-19915# National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Atmospheric Turbulence and Diffusion Lab.
METEOROLOGICAL EFFECTS OF THE COOLING TOWERS AT THE OAK RIDGE GASEOUS DIFFUSION PLANT. 1: DESCRIPTION OF SOURCE PARAMETERS AND ANALYSIS OF PLUME PHOTOGRAPHS AND HYGROTHERMOGRAPH RECORDS
S. R. Hanna and S. G. Perry Dec. 1973 42 p refs Sponsored by ERDA
(TID-26686-P1) Avail: NTIS HC $3.75

Measurements of source parameters, downwash criteria, visible plume dimensions, and water deposition rate, are presented. In some cases, such as the measurements of the initial droplet size distribution, comparisons are made with similar measurements taken by other groups. The most significant findings are listed in the summary at the end of the report. Author (NSA)

N75-19916# National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Atmospheric Turbulence and Diffusion Lab.
METEOROLOGICAL EFFECTS OF THE COOLING TOWERS AT THE OAK RIDGE GASEOUS DIFFUSION PLANT. 2: PREDICTIONS OF FOG OCCURRENCE AND DRIFT DEPOSITION
S. R. Hanna Mar. 1974 41 p refs Sponsored by ERDA
(TID-26686-P2) Avail: NTIS HC $3.75

The frequency of occurrence of fogs and the rate of deposition of chromate due to emissions from the cooling towers at the Oak Ridge Gaseous Diffusion Plant are calculated. Observations of drift deposition agree fairly well with calculated values. A detailed summary of significant findings is given at the end of the report. Author (NSA)

N75-19917# Naval Postgraduate School, Monterey, Calif.
HEAT BUDGET PARAMETERIZATION FOR THE FNWC PRIMITIVE EQUATION MODEL USING DATA FOR 16 OCTOBER 1973 M.S. Thesis
Michael Dennis Warner Sep. 1974 106 p refs
(AD-A001250) Avail: NTIS CSCL 04/2

The study was an evaluation of a two-cloud layer heating model for inclusion in a numerical weather prediction model over the ice-free ocean. The model employs empirical formulations for atmospheric absorptivities, scattering, and reflectivity, and

cloud and earth surface reflectivity to computer solar insolation received and absorbed at earth and in the key tropospheric layers above. Long-wave emissivity formulas by Sasamori for water-vapor and carbon dioxide are computed to determine cooling by the earth and troposphere. To complete the heat budget scheme for the earth's surface and near surface boundary layer, vertical transport of sensible and latent heat at the surface was evaluated. GRA

N75-19918# Naval Postgraduate School, Monterey, Calif.
A COMPARATIVE STUDY OF DIGITIZED BRIGHTNESS AND 200-mb DIVERGENCE IN THE TROPICAL WESTERN NORTH PACIFIC M.S. Thesis
Eriberth C. Varona Sep. 1974 48 p refs
(AD-A001246) Avail: NTIS CSCL 04/2

An attempt is made to investigate the relationship between the digitized satellite brightness data and the kinematically computed 200-mb divergence in the tropical western North Pacific during the period 19 April-20 December 1971. Both spectral and correlation analyses techniques are used. The power spectra of the two fields reveal two dominant period bands: one centered at approximately 10 days and the other at approximately 5 days. Horizontal structures, as shown in the inter-longitudinal cross-spectra in the two bands, suggest that brightness is more organized than divergence, although the two fields resemble well each other whenever an organized divergence pattern is observed. GRA

N75-19919# Ocean Data Systems, Inc., Rockville, Md.
INVESTIGATION OF THE APPLICATION OF STOCHASTIC MODELING TO CLIMATE PREDICTION Final Report, 1-30 Apr. 1974
J. A. Laurmann 1 Oct. 1974 43 p refs
(Contract F44620-74-C-0072)
(AD-A001922; AFOSR-74-1796TR) Avail: NTIS CSCL 04/2

This report summarizes preliminary work undertaken in consideration of the use of stochastic approaches to climate modeling. It includes a survey of the difficulties involved with representation of atmospheric dynamics for climate questions and some recommendations for directions of research needed to deal with them. The results of two specific analytic studies are included. The first demonstrates that the complete stochastic formulation in terms of an infinite hierarchy of moment equations is directly applicable to time-averaged as well as instantaneous representations of the dependent variables. The second analytic result presents a methodology for time (and space) truncation of the deterministic predictive part of the equations of atmospheric motion that can considerably reduce computation times for climatic (and weather) models. GRA

N75-19920# Environmental Technical Applications Center (Air Force), Washington, D.C.
A SYNOPTIC-SCALE MODEL FOR SIMULATING CONDENSED ATMOSPHERIC MOISTURE
Robert G. Feedes Jun. 1974 26 p refs
(AD-A002118; USAFETAC-TN-74-4) Avail: NTIS CSCL 04/2

The determination of a synoptic-scale model for simulating condensed atmospheric moisture by the USAFETAC Scientific Services Branch and the applications for which the model may be used are detailed. This study only treats the use of gridded inputs to perform the environmental simulations and, in particular, explains the use of two portions of a data base maintained by USAFETAC. The two data bases are a global cloud analysis (3DNEPH) and a global analysis of conventional parameters. The input to the model includes low, middle, high, or convective cloud types (3DNEPH), layered cloud amounts (3DNEPH), present weather conditions (3DNEPH), base, tops and midpoints of layers (AFGWC Model Terrain), and temperature and D-Value profiles (AFGWC gridded hemispheric analyses). GRA

N75-19921# Naval Weather Service Environmental Detachment, Asheville N.C.
NORTHEAST PACIFIC ENVIRONMENTAL SCENARIO
Oct. 1974 265 p refs Revised
(AD-A002067) Avail: NTIS CSCL 04/2

The environmental study covers the area 35-45 degrees N and 140-160 degrees W as well as Ocean Weather Stations (OWS's) P and N. The study area has been divided into four sub-areas. The OSW's are included because their nearly complete chronological data set is the only marine data in the vicinity which permits persistence (duration) studies in a detailed manner. Though the OWS's are quite remote from the study area, inter-comparison of individual elements that are available for all areas (in Part A Probability Graphs) will aid in estimation of persistence values in the study area by use of those given for the OWS's (in Part B - Persistence Graphs). GRA

N75-19922# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MANUAL ON THE CLIMATE OF THE USSR: CLOUD COVER AND ATMOSPHERIC PHENOMENA
P. B. Shekhtman 24 Oct. 1974 258 p Transl. into ENGLISH of the book "Spravochnik Klimatu" Leningrad, Izd vo Gidrometeorologicheskoy, no. 8, 1968 p 1-211
(AD-A001868; FTD-HC-23-1242-74) Avail: NTIS CSCL 04/2

Contents: General information and short characteristics on the behavior of cloud cover and atmospheric phenomena (cloud cover, fog, snowstorms, thunderstorms, hail); explanation of the tables (cloud cover, fog, snowstorms, thunderstorms, hail). GRA

N75-19923# Army Electronics Command, Fort Monmouth, N.J.
ON DETERMINING COST EFFECTIVENESS OF AN ARMY AUTOMATIC METEOROLOGICAL SYSTEM
Walter Miller and Bernard Engelbos Nov. 1974 13 p refs
(DA Proj. 1T1-62111-AH-71)
(AD-A002013; ECOM-5548) Avail: NTIS CSCL 04/2

Possible criteria for a cost effectiveness model for the Army Automatic Meteorological System are discussed. A determination of the nature of the problems expected to be encountered in satisfying these criteria appears similar to that in the construction of a stochastic model, where a careful balance between fidelity and tractability is essential. Barrier problems stemming from inadequacies in the interrelationship of weather and computer-played combat simulation models are also considered. GRA

N75-19924# Army Foreign Science and Technology Center, Charlottesville, Va.
STOCHASTIC ERRORS IN ESTIMATES OF PARAMETERS OF THE DISTRIBUTION FUNCTION OF FOG, CLOUD AND PRECIPITATION DROPS
G. T. Nikandrova 25 Sep. 1974 28 p refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 156, 1964 p 46-59
(AD-A002723; FSTC-HT-23-362-74) Avail: NTIS CSCL 04/2

The article determines confidence intervals for parameters of a class of distribution functions for drops in fogs, clouds and precipitations as a function of the total number of drops in the sample, both in the case when one of the parameters is known and also for the case of two unknown related parameters. The errors with which the mean dimensions of the drops are determined which are due to the finite sample are discussed and the correlation between the sample mean dimensions of the drops is investigated. GRA

N75-19755 Joint Publications Research Service, Arlington, Va.
REPRODUCTION OF THE WIND FIELD IN A CYCLONE BY SATELLITE AND RADIOSONDE DATA AS A PROBLEM OF FOUR-DIMENSIONAL ANALYSIS
D. M. Sonechkin and I. A. Belokurova *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 10-22 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 10-20 (For availability see N75-19753 11-42)

N75-19758 Joint Publications Research Service, Arlington, Va.
ADVECTIVE PECULIARITIES OF THE WEATHER ON THE EAST COAST OF THE CHUKOTKA NATIONAL OKRUG IN THE WINTER
T. V. Trutko *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 40-46 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 35-41 (For availability see N75-19753 11-42)

N75-19759 Joint Publications Research Service, Arlington, Va.
SIZE OF TYPHOON CLOUD SYSTEMS
L. S. Minina and Din Ba Chan *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 47-56 refs

Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 42-49 (For availability see N75-19753 11-42)

N75-19760 Joint Publications Research Service, Arlington, Va.
ESTIMATE OF THE POSSIBILITY OF USING THE DATA FROM A NETWORK OF THREE MRL RADARS FOR DETERMINING THE POSITION OF ATMOSPHERIC FRONTS
G. B. Brylev and G. L. Nizdoyminoga *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 57-66 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 50-57 (For availability see N75-19753 11-42)

N75-19761 Joint Publications Research Service, Arlington, Va.
PROCEDURE FOR FORECASTING THE MONTHLY AMOUNT OF PRECIPITATION IN THE TRANSCAUCASUS USING DISCRIMINANT ANALYSIS
A. A. Davitaya *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 67-72 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 58-62 (For availability see N75-19753 11-42)

N75-19765 Joint Publications Research Service, Arlington, Va.
SOME GEOSTROPHIC MODELS
G. S. Dvoryaninov *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 100-107 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 83-87 (For availability see N75-19753 11-42)

N75-19766 Joint Publications Research Service, Arlington, Va.
PROBLEM OF GEOSTROPHIC APPROXIMATIONS OF WIND VELOCITY
N. A. Bagrov *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 108-113 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 88-91 (For availability see N75-19753 11-42)

N75-19768 Joint Publications Research Service, Arlington, Va.
CENTRAL HIGH-ALTITUDE HYDROMETEOROLOGICAL OBSERVATORY
V. M. Sklyarov *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 125-132 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 98-102 (For availability see N75-19753 11-42)

N75-19769 Joint Publications Research Service, Arlington, Va.
EXPERIMENT IN THE COMPARISON OF NUMERICAL WEATHER FORECASTING SCHEMES OF THE AMERICAN NATIONAL METEOROLOGICAL CENTER AND THE COMPUTATION CENTER OF THE SIBERIAN DIVISION OF THE USSR ACADEMY OF SCIENCES
G. R. Kontarev *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 133-145 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 102-108 (For availability see N75-19753 11-42)

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N75-19925# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF OCEAN TURBULENCE
R. V. Ozmidov, ed. 28 Feb. 1975 140 p refs Transl. into ENGLISH from the book "Issledovaniye Okeanicheskoy Turbulentnosti" Moscow, Izdatelstvo Nauka, 1973 (JPRS-64208) Avail: NTIS HC $5.75

The methodology and equipment required for measuring the turbulence in oceans are discussed. The subjects considered are: (1) fluctuations of hydrophysical fields in the upper layer of the ocean, (2) local velocity fluctuations in the ocean, (3) statistical characteristics of random hydrodynamic fields in the top layer of the ocean, (4) characteristics of oceanological instruments, and (5) the influence of surface waves on passive impurity fields. For individual titles, see N75-19926 through N75-19936.

N75-19926 Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL INVESTIGATIONS OF LOCAL OCEAN TURBULENCE AT INSTITUTE OF OCEANOLOGY IMENI P. P. SHIRSHOV OF THE ACADEMY OF SCIENCES USSR
R. V. Ozmidov *In its* Invest. of Ocean Turbulence (JPRS-64208) 28 Feb. 1975 p 1-17 refs Transl. into ENGLISH from the book "Issledovaniye Okeanicheskoy Turbulentnosti" Moscow, Izdatelstvo Nauka, 1973 p 3-19 (For availability see N75-19925 11-48)

The apparatus and techniques for investigating local ocean turbulence are described. The characteristics of thermoanemometric instruments for measuring velocity pulsation are analyzed. The turbulence measurements were made using a towing mode with specially designed tow line and streamlined platforms. Turbulence measurements in the test areas were accompanied by the determination of the background hydrometeorological conditions, both with the aid of standard instruments and with new sounding and towed instruments with temperature, conductivity, and current velocity sensors. The method of recording the information received and data processing by analog computers are examined. Author

N75-19927 Joint Publications Research Service, Arlington, Va.
SOME RESULTS OF EXPERIMENTAL INVESTIGATION OF FLUCTUATIONS OF HYDROPHYSICAL FIELDS IN UPPER LAYER OF THE OCEAN
V. S. Belyayev, A. N. Gezentsvey, M. M. Lyubimtsev, R. V. Ozmidov, V. T. Paka, and V. D. Pozdynin *In its* Invest. of Ocean Turbulence (JPRS-64208) 28 Feb. 1975 p 18-29 refs Transl. into ENGLISH from the book "Issledovaniye Okeanicheskoy Turbulentnosti" Moscow, Izdatelstvo Nauka, 1973 p 20-31 (For availability see N75-19925 11-48)

Investigations of the local fluctuations of the current velocity and temperature fields in the upper layer of the open sea were conducted. The results of measurements of local fluctuations are compared with the background hydrological conditions in the test areas. The mean square values of the pulsations of hydrophysical fields are analyzed. Estimates of the rate of dissipation of turbulent energy were obtained. The possibility of the influx of kinetic energy to local turbulence in the range of scales of a few meters to several tens of meters was experimentally confirmed. Author

N75-19928 Joint Publications Research Service, Arlington, Va.
SPECTRAL CHARACTERISTICS OF LOCAL VELOCITY FLUCTUATIONS IN THE OCEAN
V. S. Belyayev, A. N. Gezentsvey, R. V. Ozmidov, V. T. Paka, and V. D. Pozdynin *In its* Invest. of Ocean Turbulence (JPRS-64208) 28 Feb. 1975 p 30-40 refs Transl. into ENGLISH from the book "Issledovaniye Okeanicheskoy Turbulentnosti" Moscow, Izdatelstvo Nauka, 1973 p 32-43 (For availability see N75-19925 11-48)

Sets of graphs of the spectral densities of current velocity pulsations based on measurements taken at six different test areas in the Atlantic and Indian oceans are presented. The range of the wave numbers for which the spectra were calculated was .02 to 7.0 per centimeter. The slope tangent of the spectra in logarithmic scale usually increased in absolute value as wave number increased. It was determined that parametrization for turbulence should be accomplished on the basis of the local background conditions. Author

N75-19929 Joint Publications Research Service, Arlington, Va.
EVALUATION OF STATISTICAL CHARACTERISTICS OF RANDOM HYDRODYNAMIC FIELDS IN TOP LAYER OF OCEAN
A. Yu. Benilov *In its* Invest. of Ocean Turbulence (JPRS-64208) 28 Feb. 1975 p 41-55 refs Transl. into ENGLISH from the book "Issledovaniye Okeanicheskoy Turbulentnosti" Moscow, Izdatelstov Nauka, 1973 p 49-63 (For availability see N75-19925 11-48)

The separation of temperature recording cuts into turbulent and wave components is described. The influence of filtration error on the form of restored cuts and their statistical characteristics are investigated. It is shown that wave noise strongly distorts the probability distribution density of turbulent fluctuations of temperature. The linear problem is generalized for the nonlinear case. Author

N75-19930 Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL INVESTIGATION OF DIFFUSION OF INDICATORS ARTIFICIALLY PLACED IN THE SEA
R. V. Ozmidov, A. N. Gezentsvey, Le-Kuang-Toay, S. S. Muravyev, and T. M. Tatarayev *In its* Invest. of Ocean Turbulence (JPRS-64208) 28 Feb. 1975 p 56-69 refs Transl. into ENGLISH from the book "Issledovaniye Okeanicheskoy Turbulentnosti" Moscow, Izdatelstvo Nauka, 1973 p 64-78 (For availability see N75-19925 11-48)

Experimental studies of the diffusion of fluorescent dyes in the Black and Baltic seas were conducted. The average concentration distribution was analyzed within the framework of semiempirical diffusion theory. The effects of elongation of the dye spot and of the rotation of its axis during an experiment in the Black sea are attributed to the influence of vertical and horizontal current velocity gradients. The spatial spectral densities were determined on the basis of recordings of the pulsations of concentration in tests with streams and spots. The parabolic dependence of the intensity of concentration pulsations on dimensionless distance is confirmed. A sharp increase of the slope of the spectral density curves (in logarithmic scale) with the passage of time is observed. Author

N75-19931 Joint Publications Research Service, Arlington, Va.
DETERMINATION OF CHARACTERISTICS OF MODERN OCEANOLOGICAL INSTRUMENTS ON THE BASIS OF INFORMATION THEORY OF MEASURING SYSTEMS
V. D. Pozdynin *In its* Invest. of Ocean Turbulence (JPRS-64208) 28 Feb. 1975 p 70-77 refs Transl. into ENGLISH from the book "Issledovaniye Okeanicheskoy Turbulentnosti" Moscow, Izdatelstvo Nauka, 1973 p 86-93 (For availability see N75-19925 11-48)

The feasibility of using information theory of measuring systems for evaluating the parameters of oceanological instruments is discussed. The minimum required information from this theory, including formulas, illustrating calculations of certain characteristics of instruments designed for measuring local turbulence in the ocean and associated background hydrometeorological conditions is given. Author

N75-19932 Joint Publications Research Service, Arlington, Va.
ON CERTAIN POSSIBILITIES AND DIFFICULTIES OF EXPERIMENTAL INVESTIGATION OF LOCAL TURBULENCE IN THE OCEAN
V. D. Pozdynin *In its* Invest. of Ocean Turbulence (JPRS-64208) 28 Feb. 1975 p 78-86 refs Transl. into ENGLISH from the book "Issledovaniye Okeanicheskoy Turbulentnosti" Moscow, Izdatelstvo Nauka, 1973 p 94-103 (For availability see N75-19925 11-48)

The capabilities and deficiencies of various instrument platforms for measuring the range of processes that occur in the ocean are discussed. The platforms considered are: (1) research ships, (2) research submarines, (3) bathyscapes, (4) self-contained, self-propelled vehicles, and (5) buoys. The development and application of turbulence meters, test stands, and temperature recording equipment are examined. The need for developing new instruments, specifically designed for recording background hydrological conditions during measurements of local turbulence, is demonstrated. Author

N75-19933 Joint Publications Research Service, Arlington, Va.
THE INFLUENCE OF SURFACE WAVES ON PASSIVE IMPURITY FIELD
A. Yu. Benilov *In its* Invest. of Ocean Turbulence (JPRS-64208) 28 Feb. 1975 p 87-98 refs Transl. into ENGLISH from the book "Issledovaniye Okeanicheskoy Turbulentnosti" Moscow, Izdatelstvo Nauka, 1973 p 104-115 (For availability see N75-19925 11-48)

The influence of the wave field of velocity on a passive impurity field is examined within the framework of a linear model. Cases of large and small Peclet numbers are analyzed. With large Peclet numbers, a diffusion sublayer occurs at the surface of the liquid. In the case of small Peclet numbers, the average profile is distorted in the entire layer embraced by wave action. Author

N75-19934 Joint Publications Research Service, Arlington, Va.
THERMOANEMOMETRIC CURRENT VELOCITY PULSATION METER
V. P. Vorobyev, Ye. I. Kuznetsov, and V. I. Fedonov *In its* Invest. of Ocean Turbulence (JPRS-64208) 28 Feb. 1975 p 99-103 refs Transl. into ENGLISH from the book "Issledovaniye Okeanicheskoy Turbulentnosti" Moscow, Izdatelstvo Nauka, 1973 p 149-153 (For availability see N75-19925 11-48)

A towed velocity pulsation meter (IPS), designed for analyzing ocean turbulence, is discussed. The IPS operates on the thermoanemometric principle. Design features of the IPS are described. The procedure for operating the IPS under ship conditions is explained. Results of measurements made with the IPS are presented. Author

N75-19935 Joint Publications Research Service, Arlington, Va.
SOME ASPECTS OF INVESTIGATION OF THE FINE STRUCTURE OF HYDROPHYSICAL FIELDS IN THE OCEAN WITH SOUNDING INSTRUMENTS
N. N. Korchashkin and R. V. Ozmidov *In its* Invest. of Ocean Turbulence (JPRS-64208) 28 Feb. 1975 p 104-110 refs Transl. into ENGLISH from the book "Issledovaniye Okeanicheskoy Turbulentnosti" Moscow, Izdatelstvo Nauka, 1973 p 154-160 (For availability see N75-19925 11-48)

The problem of distortion of vertical temperature and salinity profiles in the ocean is discussed. The effects of instrument inertia, and non-uniformity of sounding speeds due to the rolling of the ship to which the instrument is connected, are investigated. An equation is derived for determining the dependence of the measured temperature gradient on the inertia of the instrument and its sink rate. The rolling effect contributes an additional distortion to the values of the gradient recorded by the instrument, and the magnitude of this distortion depends on the amplitude and initial phase of oscillation of the instrument. Calculations of the frequencies and the minimum period of internal waves in the investigated stratified layer of the ocean are presented. Author

N75-19936 Joint Publications Research Service, Arlington, Va.
METEOROLOGICAL PREPARATION OF TURBULENCE METERS FOR EXPERIMENTAL RESEARCH AT SEA
L. G. Palevich, G. N. Panin, V. D. Pozdynin, and V. I. Fedonov *In its* Invest. of Ocean Turbulence (JPRS-64208) 28 Feb. 1975 p 111-119 refs Transl. into ENGLISH from the book "Issledovaniye Okeanicheskoy Turbulentnosti" Moscow, Izdatelstvo Nauka, 1973 p 161-168 (For availability see N75-19925 11-48)

The meteorological preparation of thermoanemometric type turbulence meters for prolonged operation at sea is described. Data obtained on turbulence meters from hydrodynamic test stand operation are presented. The indices used for evaluating the characteristics of turbulimeters are explained. The entropy values of random calibration and sensitivity errors are determined. Graphs of the current measurement accuracy are plotted. The resolving power and optimum measuring range of the conventional standard and tested instrument are calculated. Author

N75-19937# Physical Dynamics, Inc., Berkeley, Calif.
NOTE CONCERNING THE CORRELATIONS IN SPACE AND TIME OF SURFACE WAVE AMPLITUDES **Interim Report**
Kenneth M. Watson and Bruce J. West Jul. 1974 27 p refs (Contract F30602-72-C-0494; AF Proj. 1649) (AD-A002160; PD-74-064; RADC-TR-74-267) Avail: NTIS CSCL 08/3

A calculation of the de-correlation time of the ocean surface wave spectrum at large wavenumbers is given. This is based on a simple model of wave-wave interactions. The results are expressed in terms of an expected Doppler spread of scattered electromagnetic waves in the microwave regime. A calculation is also given of the distance over which de-correlation of surface waves occurs. GRA

N75-19938# Coast Guard, Washington, D.C. Oceanographic Unit.
OCEANOGRAPHY IN THE GULF OF MAINE AND ADJACENT WATERS IN SUPPORT OF THE INTERNATIONAL COMMISSION FOR NORTHWEST ATLANTIC FISHERIES, JANUARY 1968, JANUARY - FEBRUARY 1969
Melvin Light and Scott J. Henderson Aug. 1974 158 p refs (AD-A002265; USCG-373-65) Avail: NTIS CSCL 08/10

The physical oceanography of the Gulf of Maine and adjacent waters in January 1968 and January - February 1969 is described. Temperature, salinity, and density data are presented in surface contours and profiles. Dissolved oxygen and chlorophyll data are presented in section profiles. Climatic conditions of the region were reflected in the temperature and salinity of the surface waters. Intrusion of Gulf Stream waters into the Gulf of Maine is inferred from T-S relations and disolved oxygen data. GRA

N75-19939# New York Univ., N.Y. Dept. of Meteorology and Oceanography.
WAVE REFRACTION PHENOMENA OVER THE CONTINENTAL SHELF NEAR THE CHESAPEAKE BAY ENTRANCE
Yung-Yao Chao Oct. 1974 53 p refs
(Contract DACW72-71-C-0012)
(AD-A002056; CERC-TM-47) Avail: NTIS CSCL 08/3

Based on the refraction equations that account for the combined effects of bottom topography and spherical earth effects, and correct to the Mercator Projection, a computer refraction program was written and specialized to the area near the Chesapeake Light Station. A cubic spline interpolation scheme is used to define the depth value at each grid point from available depth data in appropriate bathymetric charts. In this computer program a change of mesh size is allowed to meet the change of topographic scale. GRA

N75-19940# Woods Hole Oceanographic Institution, Mass.
A COMPILATION OF MOORED CURRENT METER AND WIND OBSERVATIONS. VOLUME 7: 1968 MEASUREMENTS
Dolores Chausse and Susan Tarbell Jul. 1974 134 p refs
(Contract N00014-74-C-0262; NR Proj. 083-004)
(AD-A001715; WHOI-74-52) Avail: NTIS CSCL 08/3

Summaries of wind and current measurements made with wind recorders and current meters by the Woods Hole Oceanographic Institution during the year 1968 are presented. Averaged quantities are presented in computer-generated output as basic statistics, spectra diagrams, progressive vector diagrams, and east-north component plots. GRA

N75-19941# American Committee for the Weizmann Inst. of Science, Inc., New York.
TIDES IN THE OCEAN Final Report, 1 Sep. 1973 - 30 Sep. 1974
C. L. Pekeris 1 Oct. 1974 7 p
(Contract N00014-74-C-0055; NR Proj. 083-780)
(AD-A001797) Avail: NTIS CSCL 08/3

The report contains a review of the research carried out during the period September 1, 1973 - September 30, 1974, in the fields of Theory of Reverberation; Derivation of Laplace's Tidal Equation and The Dynamo Theory of the Origin of the Earth's Magnetic Field. It also contains abstracts of papers prepared on these subjects. GRA

N75-19942# Oregon State Univ., Corvallis. School of Oceanography.
EXPOSURE: A NEWSLETTER FOR OCEAN TECHNOLOGISTS, VOLUME 2, NUMBER 5
Gerald Appell, William E. Woodward, John Hinchman, Norman D. Farrow, and Ingvar Lauren Larsen Nov. 1974 13 p
(Contract AT(45-1)-2227)
(AD-A002271) Avail: NTIS CSCL 08/3

Contents: Directivity patterns for a Bendix Mods-10 electromagnetic current meter; Electromagnetic current meter testing; Wave research facility at Oregon State University; A shallow water mini-dredge. GRA

N75-19754 Joint Publications Research Service, Arlington, Va.
STUDY OF THE EFFECT OF OIL POLLUTION, SALINITY AND OTHER FACTORS ON THE OPTICAL PROPERTIES OF WATER IN THE INFRARED PART OF THE SPECTRUM
V. V. Bogorodskiy, M. A. Kropotkin, and T. Yu. Sheveleva *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 1-9 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 3-9 (For availability see N75-19753 11-42)

N75-19762 Joint Publications Research Service, Arlington, Va.
PROCEDURE FOR CALCULATING THE RADIATION BALANCE COMPONENTS OF THE OCEAN SURFACE
G. V. Girdyuk and T. V. Kirillova *In its* Meteorology and Hydrol., No. 12, 1974 (JPRS-64222) 3 Mar. 1975 p 73-81 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1974 p 63-69 (For availability see N75-19753 11-42)

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N75-19943# IIT Research Inst., Chicago, Ill.
OXYGEN CONSUMPTION IN FOUR SPECIES OF INVERTEBRATES AND A VERTEBRATE NATURALLY EXPOSED TO SANGUINE ELECTROMAGNETIC FIELDS Final Report
Bernard Greenberg Nov. 1974 15 p refs Prepared in cooperation with Ill. Univ., Chicago
(Contracts N00039-73-C-0030; N00039-72-C-0106)
(AD-A001925) Avail: NTIS CSCL 06/18

The oxygen consumption and respiratory quotient (RQ) of five species of animals collected adjacent to the Sanguine antenna during summer, 1973, were tested. The species were: wood louse, Oniscus asellus; the earthworms, Lumbricus terrestris and L. rubellus; slug, Arion sp.; and redbacked salamander, Plethodon cinereus cinereus. Controls were collected on the same day, 6 to 13 miles from the nearest Sanguine antenna, and both test and control groups were tested simultaneously. No significant differences were found in the oxygen consumption or RQ between any test and control group of animals. GRA

N75-19303 Max-Planck-Institut fuer Biochemie, Martinsried bei Muenchen (West Germany).
BIOLOGICAL APPLICATION: GENERAL REVIEW
K. Hannig *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 199-203 refs (For availability see N75-19285 11-12)

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N75-19944*+ National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 138
Feb. 1975 81 p refs
(NASA-SP-7011(138)) Avail: NTIS HC $4.00 CSCL 06E

This special bibliography lists 343 reports, articles, and other documents introduced into the NASA scientific and technical information system in January 1975. Author

N75-19945+ Institut National de la Sante et de la Recherche Medicale, Marseille (France). Unite de Recherche Neurobiologique.
NUMERICAL DATA PROCESSING AS APPLIED TO HUMAN NEUROPHYSIOLOGY: EVOKED ACTIVITY AND TRANSCRANIAL ELECTROENCEPHALOGRAPHY Final Report [APPLICATION DES TECHNIQUES DE TRAITEMENT DE L'INFORMATION PAR ENSEMBLE NUMERIQUE A LA NEUROPHYSIOLOGIE HUMAINE: ACTIVITES EVOQUEES ET ELECTROENCEPHALOGRAMME OBTENU PAR VOIE TRANSCRANIENNE COMPTE RENDU DE FIN DE CONTRAT]
Henri Gastaut and Henri Regis Oct. 1973 20 p refs In FRENCH
(Contract DGRST-67-00-889)
Avail: NTIS HC $3.25

A data acquisition system including analogue to digital encoding for statistical treatment of human ECG (electroencephalograms) recordings in a hospital neurophysiology unit, was set using existing computer facilities. A program for spectrum analysis

methods (correlation functions, cross-correlation, cross spectra, coherence, phase shift) and automatic classification of spectra was prepared. These methods were experimented on ECG study of sleep, central nervous system maturation processes in the child, and drug effects. Results were good for stable components, when studying slow or stepwise variations. ESRO

N75-19946*# Techtran Corp., Glen Burnie, Md.
PATHOGENIC EFFECTS OF THE THERMAL FACTOR
N. A. Fedorov, A. Yu. Tilis, T. Ya. Ar'yev, and B. A. Saakov Washington NASA May 1974 106 p refs Transl. into ENGLISH from the book "Patologicheskaya Fiziologiya Ekstremal'nykh Sostoyaniy" Moscow, Meditsina 1973 p 180-266
(Contract NASw-2485)
(NASA-TT-F-15320) Avail: NTIS HC $5.25 CSCL 06E

Articles on the following subjects are presented. The pathological physiology and the pathogenesis of the initial period of burn disease, overheating, cold trauma, and hypothermia. Other topics discussed include burn shock, after-effects of acute overheating, cardiovascular system, blood circulation, and the neurological system. Author

N75-19947*# Kanner (Leo) Associates, Redwood City, Calif.
DIURNAL VARIATIONS OF THE ACHILLES REFLEX TIME IN NORMAL MAN
J.-A. Macarez Washington NASA Mar. 1975 13 p refs Transl. into ENGLISH from Pathol. Biol. (France), v. 22, 1974 p 207-212
(Contract NASw-2481)
(NASA-TT-F-16249) Avail: NTIS HC $3.25 CSCL 06P

The Achilles tendon reflex time was recorded in the morning, at midday, and in the evening during five days in 18 normal sedentary subjects. Every recording measured the following intervals: SD (contraction time), DP (true half-relaxation time), SP (sum of SD and DP). These intervals were significantly longer in women than in men. Their variations from day to day were not very important. Contrasting with these, their diurnal variations were significant, and showed a lengthening from morning to evening, principally for DP and SP. These findings and their consequences in the clinical use of the Achilles tendon reflex time were discussed. Author

N75-19948*# Kanner (Leo) Associates, Redwood City, Calif.
BICIRCADIAN PERIOD OF SLEEP-WALKING CYCLE IN BEYOND TIME ISOLATION. A POLYGRAPHIC STUDY
G. Chouvet, J. Mouret, J. Coindet, M. Siffre, and M. Jouvet Washington NASA Mar. 1975 27 p refs Transl. into ENGLISH from Electroencephalogr. Clin. Neurophysiol. (Canada) v. 37, 1974 p 367-380
(Contract NASw-2481)
(NASA-TT-F-16212) Avail: NTIS HC $3.75 CSCL 06P

Young male subjects were polygraphically recorded (137 sleep records), while isolated beyond time in caves for five to six months. Control recordings were performed just before and after their isolation. With variable latencies all the subjects reached a bicircadian rhythm (34 hours of wakefulness followed by 14 hours of sleep) which they considered subjectively as 24-hourly. Only one subject was able to adapt completely to this new rhythm and maintain it over more than two months. The use of an external Zeitgeber was effective in reducing the relative variability of this rhythm. The observed variations in sleep are given and the internal organization of sleep is discussed in relation to the adaptability to a bicircadian rhythm. Author

N75-19949# Massachusetts Inst. of Tech., Cambridge. Dept. of Metallurgy and Materials Science.
BUCKLING STUDIES OF SINGLE HUMAN TRABECULAE
Paul R. Townsend, Robert M. Rose, and Eric L. Radin Oct. 1974 20 p refs
(Contract N00014-67-A-0204-0066)
(AD-A000264/2; TR-8) Avail: NTIS HC $3.28 CSCL 06/16

The nonideal inelastic buckling behavior of single trabeculae from the subchondral region of the human medial tibial plateau was investigated. Wet specimens exhibited ductile buckling, whereas dry specimens buckled in a brittle manner. Extrapolation to ideal slenderness ratios showed Young's modulus to be 1,650,000 psi in the wet state, and 2,050,000 psi in the dry state, reasonably similar to cortical bone. Author (GRA)

N75-19950# Missouri Univ., Rolla. Materials Research Center.
FEASIBILITY STUDY ON A PROCESS FOR ELECTROLESS METAL DEPOSITION IN PITS AND FISSURES OF TEETH FOR USE IN PREVENTIVE DENTISTRY Annual Report
Thomas J. OKeefe Jul. 1974 55 p refs
(Contract DADA17-73-C-3087)
(AD-A002071; AR-1) Avail: NTIS CSCL 06/12

A feasibility study on the electroless metal plating of teeth has been conducted. The primary purpose of the study was to evaluate the possible use of a chemically deposited metal film as a pit and fissure sealant. All of the work reported was performed on extracted human teeth. The process consists of applications of suitable metal deposition solutions and reducing agents in a sufficient number of sequences to provide the desired coating thickness. Copper and/or silver films in the range of 0.003 inches can be obtained in less than ten minutes. The deposits are adherent and resist scratching when standard dental hand tools are used. The deposits were also characterized by means of scanning electron microscopy, X-ray analysis and Auger analysis. GRA

N75-19951# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE DEGREE OF DANGER OF INDUSTRIAL SUBSTANCES, SPECIFIC SENSITIVITY, AND SAFETY FACTOR IN THE ESTABLISHMENT OF MAXIMUM PERMISSIBLE CONCENTRATION (MPC)
I. P. Ulahova 12 Nov. 1974 19 p refs Transl. into ENGLISH from the book "Printsipy i Metody Ustanovleniya Predelno Dopustimykh Kontsentratsii Vrednykh Veshchestv v Vozdukhe Proizvodstvennykh Promeshenii, but Pub. in Mezhdunarodnogo Seminara Uchenykh Sotsialisticheskikh Stran, 25-29 Nov. 1968" Moscow, Izd vo Meditsina, 1970 p 65-76
(AD-A001855; FTD-MT-24-994-74) Avail: NTIS CSCL 06/10

The report presents the indicators of potential danger and the indicators of the danger of acute lethal poisoning of several industrial chemicals. Also included are the lethal doses of these chemicals to animals and man. GRA

N75-19952# Florida Univ., Gainesville. Dept. of Physiology.
MECHANICS OF BREATHING AT REDUCED BAROMETRIC PRESSURES OF FLIGHT Final Report
Arthur B. Otis and Marc J. Jaeger 30 Oct. 1974 63 p refs
(Contract F44620-70-C-0109; AF Proj. 9777)
(AD-A001930; AFOSR-74-1795TR) Avail: NTIS CSCL 06/19

The studies accomplished may be divided into five main categories: studies of the mechanics of forced expiration and coughing at ground level with ambient air as the inspired gas; similar studies at simulated altitudes of 18,000 and 27,000 feet; similar studies at ground level with gas mixtures of different densities as the inspired gas; studies of the effect of gas density on a mechanical model to simulate clearance of mucous from the respiratory tract; and analog computer modelling of various breathing maneuvers. In addition to purely physical factors, these studies have involved several physiological factors including compliance and resistance of the lung and airways, the pressure-volume relationship of the chest, the force-velocity and relationship of the respiratory muscles, and the contraction and relaxation time of these muscles. This report presents pertinent data and conclusions. GRA

N75-19953# Desmatics, Inc., State College, Pa.
RESEARCH ON HUMAN IMPACT ACCELERATION DYNAMIC RESPONSE AND INJURY, SOME STATISTICAL ASPECTS OF MODELING Annual Report, Dec. 1973 - Nov. 1974
Dennis E. Smith Dec. 1974 22 p refs
(Contract N00014-74-C-0154; RR04120)
(AD-A002443; TR-102-1) Avail: NTIS CSCL 06/19

The report describes an ongoing research investigation of statistical aspects underlying development of mathematical models of human impact acceleration dynamic response and injury. Particular attention is paid to the requirements and constraints imposed on human accelerator runs. GRA

N75-19954# Aerospace Medical Div., Brooks AFB, Tex.
AIR FORCE TECHNICAL OBJECTIVE DOCUMENT: AMD FISCAL YEAR 1976 Final Report

Thomas D. N. Douthit 16 Dec. 1974 43 p
(AD-A002580; AMD-TR-74-1) Avail: NTIS CSCL 06/2

The document describes the planning methodology used within the Aerospace Medical Division (AMD) laboratories' five technology areas. Efforts were directed in the biotechnology program to man's adaptability, survivability, and performance capabilities within his operational environment. The research and development of AMD's functions is accomplished as disciplinary work by teams of biomedical scientists, engineers and physical scientists within the Air Force laboratories and the industrial and academic research and development communities. GRA

N75-19955# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
SPINDLE AND RAPID EYE MOVEMENT DETECTORS FOR USE WITH SLEEP ANALYZERS M.S. Thesis
Joseph C. Christian Sep. 1974 86 p refs
(AD-A002665; GE/EE/74-69) Avail: NTIS CSCL 06/2

The purpose of this study is to develop electronic detectors capable of detecting spindles and conjugate rapid eye movements in the human electroencephalogram EEG and EOG electrooculograph. Period analysis is used as the basis for the detection of spindles (defined as rythmic bursts of EEG activity of 12-14 Hz lasting for at least 0.5 second). A phase detection scheme is used to identify the occurrence of conjugate eye movements. Sixteen hours of EEG and EOG data were analyzed using the detectors. The spindle detector exhibited a 90% detection accuracy when used to separate sleep stages 2, 3, or 4 and stages 0, 1, or REM. A 68% detection accuracy was achieved by the REM detector. GRA

N75-19153* Illinois Univ., Chicago. Coll. of Engineering.
A STOCHASTIC MODEL OF THE ELECTROMYOGRAM
Gyan C. Agarwal and Gerald L. Gottlieb *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 327-333 refs Sponsored in part by NSF (For availability see N75-19126 11-01)
CSCL 06E

N75-19155* Medical Coll. of Ohio, Toledo. Dept. of Neurosciences.
THE MUSCLE SPINDLE AS A FEEDBACK ELEMENT IN MUSCLE CONTROL
Lee T. Andrews, Anthony M. Iannone, and Donald J. Ewing (Toledo Univ., Ohio) *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 353-363 refs (For availability see N75-19126 11-01)
CSCL 06P

N75-19156* Massachusetts Inst. of Tech., Cambridge.
CONTINUOUSLY VARYING SKIN POTENTIALS ELICITED BY SINUSOIDALLY VARYING ELECTRIC SHOCK POTENTIALS
J. W. Senders, V. L. Senders, and B. Tursky *In its* Proc. of the 9th Ann. Conf. on Manual Control 1973 p 365-365b (For availability see N75-19126 11-01)
CSCL 06E

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N75-19956 Maryland Univ., College Park.
THEORETICAL INVESTIGATION OF THE CIRCADIAN RHYTHM Ph.D. Thesis
John William Avitabile, Jr. 1974 128 p
Avail: Univ. Microfilms Order No. 74-29048

An effort is made to show the possible connection between macroscopically observable properties of the circadian rhythm and microscopic theories of chemical processes in the cell. In particular, the Goodwin model for epigenetic oscillations is studied extensively, and it is shown that various properties of this model are analogous to properties of the circadian rhythm. It is determined from these studies that light intensity may affect cells by changing the diffusion and transport rates of mRNA. Time delay is introduced into the Goodwin model and it is found that to produce oscillations which have a period on the order of 24 hours a delay in mRNA transport of about 24 minutes is probably required. It is pointed out that experimental measurements of the time required for mRNA diffusion out of the cell nucleus indicate that the process takes 15 to 30 minutes.
Dissert. Abstr.

N75-19957 Florida Univ., Gainesville.
DYNAMICS AND OPTIMIZATION OF A HUMAN MOTION PROBLEM Ph.D. Thesis
Tushar Kanti Ghosh 1974 164 p
Avail: Univ. Microfilms Order No. 74-27873

A particular gymnastic maneuver, namely, the kip-up maneuver is examined experimentally and theoretically. A mathematical model for a human performer is constructed for this maneuver from the best personalized inertia and joint centers model of a human being available today. Experiments with the human performer and photographic data collection methods are discussed. Comparisons of the observed motion with solutions of the mathematical model equations are presented. Discrepancies between the actual motion and the computed motion are explained in terms of principles of mechanics and errors in measurements. Some changes in the model are suggested. Dissert. Abstr.

N75-19958*# Michigan Univ., Ann Arbor. Dept. of Aerospace Engineering.
THE MANUAL CONTROL OF VEHICLES UNDERGOING SLOW TRANSITIONS IN DYNAMIC CHARACTERISTICS
Thomas E. Moriarty [1974] 145 p refs
(Grant NSR-23-005-364)
(NASA-CR-132442) Avail: NTIS HC $5.75 CSCL 05E

The manual control was studied of a vehicle with slowly time-varying dynamics to develop analytic and computer techniques necessary for the study of time-varying systems. The human operator is considered as he controls a time-varying plant in which the changes are neither abrupt nor so slow that the time variations are unimportant. An experiment in which pilots controlled the longitudinal mode of a simulated time-varying aircraft is described. The vehicle changed from a pure double integrator to a damped second order system, either instantaneously or smoothly over time intervals of 30, 75, or 120 seconds. The regulator task consisted of trying to null the error term resulting from injected random disturbances with bandwidths of 0.8, 1.4, and 2.0 radians per second. Each of the twelve experimental conditons was replicated ten times. It is shown that the pilot's performance in the time-varying task is essentially equivalent to his performance in stationary tasks which correspond to various points in the transition. A rudimentary model for the pilot-vehicle-regulator is presented. Author

N75-19959*# Kanner (Leo) Associates, Redwood City, Calif.
ACTIVITY PROFILE OF PIRACETAM IN PSYCHOSYNDROMES AND SYMPTOMATIC PSYCHOSES
A. Voelkel Washington NASA Mar. 1975 12 p refs Transl. into ENGLISH from Arzneim-Fosch. (West Germany), v. 24, no. 8, 1971 p 1127-1129
(Contract NASw-2481)
(NASA-TT-F-16217) Avail: NTIS HC $3.25 CSCL 05J

The encephalotropic effect of 2-oxo-pyrrolidine-acetamide (Piracetam) is observed in patients with different reversible encephalopathic psychosyndromes combined with depressive or paranoid syndromes. This pilot study shows that the most important effect is a remarkable restoration of memory, vigilance, lucidity, and differentiation. Furthermore, Piracetam is able to provoke psychotic reactions with paranoid symptoms and hallucinations in cases with uncertain subclinical psychotic syndromes with dissimulation. Author

N75-19960*# Planar Corp., Alexandria, Va.
PSYCHOLOGICAL STRESS MEASUREMENT THROUGH VOICE OUTPUT ANALYSIS
Harry J. Older and Larry L. Jenney Mar. 1975 56 p refs
(Contract NAS9-14146)
(NASA-CR-141723) Avail: NTIS HC $4.25 CSCL 05J

Audio tape recordings of selected Skylab communications were processed by a psychological stress evaluator. Strip chart tracings were read blind and scores were assigned based on

characteristics reported by the manufacturer to indicate psychological stress. These scores were analyzed for their empirical relationships with operational variables in Skylab judged to represent varying degrees of situational stress. Although some statistically significant relationships were found, the technique was not judged to be sufficiently predictive to warrant its use in assessing the degree of psychological stress of crew members in future space missions. Author

N75-19961# Defense Documentation Center, Alexandria, Va.
USE OF COMPUTERS IN HUMAN FACTORS ENGINEERING Report Bibliography, Nov. 1958 - Apr. 1974
Nov. 1974 225 p refs
(AD-A001400; DDC-TAS-74-34) Avail: NTIS CSCL 05/5

The bibliography contains 178 references to reports pertinent to the application of techniques for computer handling of human factors data. The indexes included are Corporate Author-Monitoring Agency and Subject. GRA

N75-19962# Naval Training Equipment Center, Orlando, Fla.
TRAINING SITUATION ANALYSIS STUDY FOR THE T-34C EXPANDED PRIMARY FLIGHT TRAINING PHASE Final Report, Sep. 1973 - Nov. 1974
W. M. Komanski, R. E. Picton, and R. W. Camp Nov. 1974 450 p refs
(AD-A002258; NACTRAEQUIPC-IH-238) Avail: NTIS CSCL 05/9

The report provides the methodology and procedures utilized in the conduct of the training situation analysis for the T-34C Expanded Primary Flight Training Phase. It recommends training and simulation media which will provide optimum support for the proposed Expanded Primary Flight Training Phase. GRA

N75-19963# Army Aeromedical Research Lab., Fort Rucker, Ala.
AVIATOR PERFORMANCE DURING LOCAL AREA, LOW LEVEL AND NAP-OF-THE-EARTH FLIGHT Final Report
Kent A. Kimball, Thomas L. Frezell, Mark A. Hofmann, and Allen C. Snow, Jr. Sep. 1974 26 p
(AD-A001683; USAARL-75-3) Avail: NTIS CSCL 05/10

The paper presents baseline data concerning aviator performance and aircraft state variables during local area, low level and nap-of-the-earth flights. Further, information is provided concerning differences in aviator control inputs per unit of time across the three profiles. From the data, it is evident that NOE flight places more demands on both crews and aircraft than the other two types of flight. GRA

N75-19964# Ohio State Univ., Columbus.
AIRCRAFT-SIMULATOR TRANSFER PROBLEMS Final Report, 1 Apr. 1972 - 30 Apr. 1974
Robert L. Wick, Jr., Charles E. Billings, Ralph J. Gerke, and Robert C. Chase Sep. 1974 69 p refs
(Contract F33615-72-C-1308; AF Proj. 7220)
(AD-A002140; AMRL-TR-74-68) Avail: NTIS CSCL 05/10

Five highly experienced instrument-rated pilots flew eight instrument landing system approaches while under the influence of a placebo, 100 mgms and 200 mgms of secobarbital for a total of twenty-four approaches. The aircraft used was highly instrumented to record their performance. The entire series of flights was replicated in a modern, similarly instrumented flight simulator. A comparison of the results indicate the simulator to be more sensitive to drug effects. Some learning effects were noted in the simulator flights indicating that skilled airplane pilots are not necessarily skilled simulator pilots as well. The arousal effects associated with actual flight apparently compensated for some portion of the drug effect leading one to the conclusion that there is still no adequate substitute for inflight studies. GRA

N75-19965# Dunlap and Associates, Inc., la Jolla, Calif.
PILOT LANDING PERFORMANCE UNDER HIGH WORK-LOAD CONDITIONS
C. A. Brictson Apr. 1974 16 p refs
(Contract N00014-73-C-0053; NR Proj. 201-146)
(AD-A001802) Avail: NTIS CSCL 05/10

The influence of practice on carrier landings is discussed in relation to high cumulative workload. The performance criterion was used to identify potential night pilots on the basis of landing proficiency. High and low proficiency pilots also were identified and diagnostic training information provided. A statistically significant increase in night landing performance during high cumulative workload may be due to practice effects as well as workload. GRA

N75-19966# International Business Machines Corp., Yorktown Heights, N.Y. Thomas J. Watson Research Center.
DATA ORGANIZATION Technical Interim Report
Bruce M. Durding, Curtis A. Becker, and John D. Gould Nov. 1974 43 p refs
(Contract N00014-72-C-0419; NR Proj. 197-020)
(AD-A001769; RC-4956) Avail: NTIS CSCL 05/10

Three word list experiments investigated how people organize data. Sets of 15 to 20 words had pre-defined organizations: hierarchy, networks, lists, table, and random, based on semantic relations. Experiment 1 indicated that college students had these organizational structures available for use. Most subjects used organizations that most easily preserved the relations, but a few organized nearly all sets into lists which maintained the semantic relations. Experiment 3 showed how subjects have difficulty in preserving relations among data if required to organize into inappropriate structures. Results are evaluated for use in computer based information retrieval systems. GRA

N75-19967# Yale Univ., New Haven, Conn. Dept. of Administrative Sciences.
EFFECTS OF TASK PERFORMANCE STRATEGIES ON GROUP PERFORMANCE EFFECTIVENESS
J. Richard Hackman, Janet A. Weiss, and Kenneth R. Brousseau Oct. 1974 49 p refs
(Contract N00014-67-A-0097-0026; NR Proj. 170-744)
(AD-A001707; TR-5) Avail: NTIS CSCL 05/10

Norms controlling how members deal with performance strategies were altered experimentally in small task-oriented groups. The basic task required assembly of small electrical components. In one task condition (equal information) all task-relevant information was provided to each group member; in another (unequal information) it was spread unevenly among members, requiring exchange of information for optimum group performance. Measures of interaction process and of member reactions to the group were obtained, and were affected substantially by the experimental interventions. GRA

N75-19968# Naval Aerospace Medical Research Lab., Pensacola, Fla.
MAJOR ORIENTATION-ERROR ACCIDENTS IN REGULAR ARMY UH-1 AIRCRAFT DURING FISCAL YEAR 1970, ACCIDENT FACTORS
W. Carroll Hixson, Jorma I. Niven, and Emil Spezia 5 Jun. 1974 33 p refs
(MF51524)
(AD-A001710; NAMRL-1202; USAARL-74-12) Avail: NTIS CSCL 05/10

The report is the fourth in a series dealing with the pilot disorientation/vertigo problem in Regular Army UH-1 helicopter operations. Individual case history data extracted from the USAAAVS master aircraft accident files are presented on major orientation-error accidents that occurred in UH-1 aircraft during fiscal year 1970. Summary listings involving a variety of operational and pilot-related accident factors are presented for each of the 42 cases. The listings are arranged to distinguish between factors and events before takeoff, i.e., the initial conditions associated with a given accident, and those which occurred or were manifested during the actual airborne phase of the accident flight. GRA

N75-19969# Air Force Human Resources Lab., Brooks AFB, Tex.
FISCAL YEAR 1975: AIR FORCE TECHNICAL OBJECTIVE DOCUMENT
Sep. 1974 19 p
(AD-A002154; AFHRL-TR-74-81) Avail: NTIS CSCL 05/9

The document provides the academic and industrial R and D community with a summary of the technical area objectives of Air Force research in the field of human resources. The areas covered are: (a) Personnel systems technology and

utilization; (b) education and training technology; (c) performance evaluation; and (d) human resources data and systems design and operation. GRA

N75-19970# Naval Training Equipment Center, Orlando, Fla.
CAPABILITIES IN WIDE ANGLE VISUAL TECHNOLOGY Interim Report
Carl R. Driskell Dec. 1974 111 p
(AD-A002706; NAVTRAEQUIPC-IH-237) Avail: NTIS CSCL 05/9

This report provides a sound technological basis for the specification of advanced visual systems for state-of-the-art aircraft flight simulators. The results of a survey of current and near-term wide angle visual systems are presented. Hardware and training risks are assessed for the application of various image generation sources and wide angle visual systems to specific pilot training tasks. Specification language is provided as a guide for procurement of a wide angle visual system with a full mission capability. GRA

N75-19971# Naval Submarine Medical Research Lab., Groton, Conn.
SHALLOW HABITAT AIR DIVE SHAD-1 PSYCHOLOGICAL SCREENING OF DIVERS AS SUBJECTS FOR LONG DURATION SATURATION EXPERIMENTATION Medical Research Progress Report No. 31
Benjamin B. Weybrew 31 May 1974 60 p refs
(AD-A002707; NSMRL-776) Avail: NTIS CSCL 05/10

This study was designed to provide some insights as to possible psychological screening criteria for U. S. Navy divers being considered for special operational assignments. Four USN divers who had volunteered for SHAD-1 (Shallow Habitat Air Dive) were administered the DPSS (Depression proneness sentence stems), the MMPI (Minnesota multiphasic personality inventory), the DBI (Diver biographical inventory) and were subjected to a semi-structured clinical interview before and after a 30-day, hyperbaric (50 F.S.W.) experiment. These test and interview data were compared with the same data obtained from an independent sample of 64 USN divers, and provided the basis for selecting two SHAD subjects and two back-up divers. GRA

N75-19972# Ohio State Univ. Research Foundation, Columbus.
PERCEPTUAL DIFFERENCES AMONG CONSONANTS
John W. Black May 1974 135 p refs
(Contract N00014-67-A-0232-0003; NR Proj. 197-004)
(AD-A002286; OSURF-2928-TR-17) Avail: NTIS CSCL 05/7

The report is a summary of a series of studies that relate to the scaling of the relative similarities-dissimilarities among pairs of syllables that differ in the initial consonants or consonanal clusters. Sixty manners of commencing syllables were assessed. The measures of similarity-dissimilarity were obtained from panels of judges who followed the procedures of magnitude estimation. The panels responded to 576 pairs of consonant-vowel syllables, to these consonants as the first sounds of viewed words, to 3600 pairs of consonants/consonantal cluster-vowel syllables, and to these syllables reproduced backward. The judgments of individual listeners were tested for reliability by analysis of variance. GRA

N75-19127* Michigan Univ., Ann Arbor. Dept. of Aerospace Engineering.
EFFECTS OF VISUAL FLIGHT DISPLAY DYNAMICS ON ALTITUDE TRACKING PERFORMANCE IN A FLIGHT SIMULATOR
E. F. Weener, R. M. Howe, and R. W. Pew *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 3-8 (For availability see N75-19126 11-01)
CSCL 05E

N75-19129* Massachusetts Inst. of Tech., Cambridge. Man-Vehicle Lab.
THE EFFECT OF COMMUNICATIONS AND TRAFFIC SITUATION DISPLAYS ON PILOTS AWARENESS OF TRAFFIC IN THE TERMINAL AREA
D. Melanson, R. E. Curry, J. D. Howell, and M. E. Connelly *In its* Proc. of the 9th Ann. Conf. on Manual Control 1973 p 25-39 refs (For availability see N75-19126 11-01)
CSCL 05E

N75-19136* Systems Technology, Inc., Hawthorne, Calif.
HANDLING PROPERTIES OF DIVERSE AUTOMOBILES AND CORRELATION WITH FULL SCALE RESPONSE DATA
Roger H. Hoh and David H. Weir *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 103-118 refs (For availability see N75-19126 11-01)
(Contract DOT-FH-11-7570)
CSCL 05E

N75-19139* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PILOT PERFORMANCE DURING A SIMULATED STANDARD INSTRUMENT PROCEDURE TURN WITH AND WITHOUT A PREDICTOR DISPLAY
John G. Kreifeldt (Tufts Univ.) and Thomas Wempe *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 147-162 refs (For availability see N75-19126 11-01)
CSCL 05E

N75-19142* Massachusetts Inst. of Tech., Cambridge. Man-Vehicle Lab.
VISUALLY INDUCED SENSATIONS OF MOTION
L. R. Young, J. M. Dichgans, and C. M. Oman *In its* Proc. of the 9th Ann. Conf. on Manual Control 1973 p 193-195 refs (For availability see N75-19126 11-01)
CSCL 05E

N75-19143* General Motors Corp., Detroit, Mich.
SENSITIVITY OF A CRITICAL TRACKING TASK TO ALCOHOL IMPAIRMENT
Jean A. Tennant and Richard R. Thompson *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 201-213 refs (For availability see N75-19126 11-01)
CSCL 05E

N75-19144* Systems Technology, Inc., Hawthorne, Calif.
MEASUREMENT OF DRIVER/VEHICLE MULTILOOP RESPONSE PROPERTIES WITH A SINGLE DISTURBANCE INPUT
Duane T. McRuer, David H. Weir, Henry R. Jex, Raymond E. Magdaleno, and R. Wade Allen *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 217-232 refs (For availability see N75-19126 11-01)
CSCL 05E

N75-19146* Systems Technology, Inc., Hawthorne, Calif.
COMPARISONS OF POPULATION SUBGROUPS PERFORMANCE ON A KEYBOARD PSYCHOMOTOR TASK
Robert L. Stapleford *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 245-255 (For availability see N75-19126 11-01)
CSCL 05E

N75-19148* Wright State Univ., Dayton, Ohio.
THE EFFECTS OF DISPLAY VARIABLES AND SECONDARY LOADING ON THE DUAL AXIS CRITICAL TASK PERFORMANCE
George M. Swisher and S. Nataraj (Sinclair Community Coll., Dayton, Ohio) *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 265-278 refs (For availability see N75-19126 11-01)
CSCL 05E

N75-19149* Technische Hogeschool, Delft (Netherlands). Man-Machine Systems Group.
PARAMETER ESTIMATION IN LINEAR MODELS OF THE HUMAN OPERATOR IN A CLOSED LOOP WITH APPLICATION OF DETERMINISTIC TEST SIGNALS
A. VanLunteren and H. G. Stassen *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 289-297 refs (For availability see N75-19126 11-01)
CSCL 05E

N75-19150* Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
IDENTIFICATION OF HUMAN OPERATOR PERFORMANCE MODELS UTILIZING TIME SERIES ANALYSIS
Frank M. Holden and Stanley M. Shinners (Sperry Rand Corp.,

Great Neck, N. Y.) *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 301-309 refs (For availability see N75-19126 11-01)
CSCL 05E

N75-19151* National Aerospace Lab., Amsterdam (Netherlands).
IN-FLIGHT MEASURED HUMAN PILOT DESCRIBING FUNCTION AND REMNANT FOR PITCH ATTITUDE CONTROL
H. A. Mooij *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 311-317 refs (For availability see N75-19126 11-01)
CSCL 05H

N75-19154* Systems Technology, Inc., Hawthorne, Calif.
MODELING AND MEASURING LIMB FINE-MOTOR UNSTEADINESS
Raymond E. Magdaleno, Henry R. Jex, and R. Wade Allen *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 335-349 refs (For availability see N75-19126 11-01)
CSCL 05E

N75-19157* Technische Hogeschool, Delft (Netherlands).
MODELING THE BEHAVIOR OF THE HELMSMAN STEERING A SHIP
W. Veldhuyzen and H. G. Stassen *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 367-377 refs (For availability see N75-19126 11-01)
CSCL 05E

N75-19158* Systems Technology, Inc., Princeton, N.J.
FURTHER EXAMINATION OF PILOT INSTRUMENT SCANNING DATA AND DEVELOPMENT OF A NEW LINK VALUE ESTIMATOR
Lee Gregor Hofmann, Warren F. Clement, and Richard E. Blodgett *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 379-387 refs (For availability see N75-19126 11-01)
(Contract F33615-71-C-1349)
CSCL 05E

N75-19159* Systems Technology, Inc., Princeton, N.J.
A DIRECT PROCEDURE FOR PARTITIONING SCANNING WORKLOAD IN CONTROL DISPLAY SYSTEM DESIGN
W. F. Clement, L. G. Hofmann, and D. Graham *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 389-400 refs (For availability see N75-19126 11-01)
(Contract F33615-71-C-1349)
CSCL 05E

N75-19160* Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
A LINEAR STOCHASTIC MODEL OF THE HUMAN OPERATOR
John C. Durrett *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 405-412 refs (For availability see N75-19126 11-01)
CSCL 05E

N75-19161* Tufts Univ., Medford, Mass. Dept. of Engineering Design.
MODELS OF MAN AS A SUBOPTIMAL PREDICTOR
William B. Rouse *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 413-417 refs (For availability see N75-19126 11-01)
CSCL 05E

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N75-19973# Fortifikationsfoervaltningen, Stockholm (Sweden).
CALCULATION ROUTINES FOR EVALUATION OF TEST RESULTS
Ulf Keijer 10 May 1974 35 p refs In SWEDISH; ENGLISH summary
(FortF/F-134:2) Avail: NTIS HC $3.75

A number of subroutines for reading and evaluating test results obtained at the RSFA research and test station at Marsta are described. Measurements made at every shot and measuring point are collected in real time by means of a tape recorder. By the use of analogue-to-digital conversion and a transient recorder digital values from every test can be stored in a 1 K word MOS memory. From this memory a paper tape punch generates a paper tape, which can be run by a terminal. The tape is also provided with manually punched symbols for indentification and parameter values. The various subroutines are compiled into a main program by the user. Additional subroutines can be added by the users, and combined with other parts of the program package. Author

N75-19974# Materials Research Labs., Maribyrnong (Australia).
A NEW METHOD OF MANUFACTURING INFLATABLE LIFE-JACKETS
R. H. E. Huang Nov. 1974 18 p refs
(Rept-618) Avail: NTIS HC $3.25

A method is described of manufacturing inflatable rubber bladders for life-jackets by latex dipping. The bladders are encased in fabric covers to produce life-jackets. The advantages of this method of construction, are discussed. Author

N75-19975*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TECHNOLOGY AND THE NEUROLOGICALLY HANDICAPPED
Washington 1974 278 p refs Conf. held at Moffett Field, Calif., 8-10 Sep. 1971; sponsored in part by United Cerebral Palsy Foundation
(NASA-SP-363) Avail: NTIS HC $8.75 CSCL 06B

Bioengineering approaches to the treatment of neurologically handicapped persons consider neurophysiological aspects of control systems and man machine integration. For individual titles, see N75-19976 through N75-19998.

N75-19976* New York Univ., N.Y. Dept. of Aeronautics and Astronautics.
THE CONCEPT OF TECHNOLOGY TRANSFER
Lee Arnold *In* NASA. Ames Res. Center Technol. and the Neurologically Handicapped 1974 p 1-2 (For availability see N75-19975 11-54)
CSCL 06B

Potential benefits from aerospace technology applications are elaborated that will enable the neurologically handicapped to recapture and upgrade some of their motor and sensor functions. Considered are all individuals whose sensorimotor communication systems have been damaged as a result of disease, trauma, or aging. G.G.

N75-19977* National Aeronautics and Space Administration, Washington, D.C.
NASA AND TECHNOLOGY
DeMarquis D. Wyatt *In its* Technol. and the Neurologically Handicapped 1974 p 3-6 (For availability see N75-19975 11-54)
CSCL 06B

Potential contributions of NASA technology to enable the neurologically handicapped to cope with a normal environment are outlined. Research and development in the area of man's responses and accommodations to environmental stress are closely related to medical aspects of technological assistance devices for the neurologically handicapped. G.G.

N75-19978* National Institutes of Health, Bethesda, Md.
HEW AND THE NEUROLOGICALLY HANDICAPPED
Warren V. Huber *In* NASA. Ames Res. Center Technol. and the Neurologically Handicapped 1974 p 7-16 (For availability see N75-19975 11-54)
CSCL 06B

Some of the neurological disorders and therapeutic devices are considered with which the Department of Health, Education, and Welfare (HEW) is most concerned. The organization of the

Department, because it is a rather complex one with many different agencies involved, is also described. Author

N75-19979* Veterans Administration, Washington, D.C.
REHABILITATION AND THE VETERANS' ADMINISTRATION
Franklin Meister *In* NASA. Ames Res. Center Technol. and the Neurologically Handicapped 1974 p 17-20 (For availability see N75-19975 11-54)
CSCL 06B

The Veteran's Administration health care system provides prosthetic and sensory aids for the rehabilitation of neurologically handicapped veterans. Research and development centers include prosthetic clinic teams, orthopedic shops, restoration clinics, bioengineering services, orthotics, etc. G.G.

N75-19980* Department of Transportation, Washington, D.C. Office of the Secretary.
TRANSPORTATION AND THE HANDICAPPED
Herbert H. Richardson *In* NASA. Ames Res. Center Technol. and the Neurologically Handicapped 1974 p 21-34 refs (For availability see N75-19975 11-54)
CSCL 06B

Some statistics on the handicapped in relation to transportation are considered, and some of the major deterrents to travel in our existing systems are outlined. Some of the benefits of enhanced mobility are identified and examples are given of minimizing travel barriers. Finally, some of DOT's activities that are directed toward improving transportation for the handicapped are outlined. Author

N75-19981* National Academy of Sciences - National Research Council, Washington, D.C.
THE NATIONAL RESEARCH COUNCIL PROGRAM ON AID TO THE NEUROLOGICALLY HANDICAPPED
Colin McLaurin *In* NASA. Ames Res. Center Technol. and the Neurologically Handicapped 1974 p 35-38 (For availability see N75-19975 11-54)
CSCL 06B

The multidisciplinary care of neuromuscular disabled patients is reviewed. Described are the activities of occupational and vocational therapists, social workers, clinical psychologists and speech pathologists that are directed toward the major effects of spinal cord injuries, amputations, stroke, cerebral palsy, and rheumatoid arthritis. G.G.

N75-19982* National Inst. of Neurological Diseases and Stroke, Bethesda, Md.
NEURAL CONTROL: LONG-RANGE PROSPECTS
Terry Hambrecht *In* NASA. Ames Res. Center Technol. and the Neurologically Handicapped 1974 p 39-44 (For availability see N75-19975 11-54)
CSCL 06B

The development of long term connections with the nervous system, are considered for direct transfer of information into the nervous system, and for direct readout of information from the nervous system. The study of basic neurophysiological control mechanisms operating in the nervous system is advocated for the investigation of potential applications of such developments. These applications depend strongly on the successful achievement of the first three objectives. An attempt is made to envision the social consequences of these developments. Author

N75-19983* Rancho Los Amigos Hospital, Inc., Downey, Calif.
CURRENT THERAPEUTIC TECHNIQUES AND REHABILITATION FROM NEUROLOGICAL DISORDERS
Vernon L. Nickel and John D. Hsu *In* NASA. Ames Res. Center Technol. and the Neurologically Handicapped 1974 p 45-54 (For availability see N75-19975 11-54)
CSCL 06B

Rancho Los Amigos Hospital is a 1100-bed teaching hospital that is primarily oriented toward rehabilitation. The individual services that deal with neuromuscular disorders are categorically disease entity oriented: They are directed toward the major problems, such as spinal cord injuries, amputations, stroke, cerebral palsy, and rheumatoid arthritis. The services at Rancho cross many traditional medical specialty barriers. Author

N75-19984* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE USE OF OBJECTIVE MEASUREMENTS IN THE EVALUATION OF THERAPY PROGRAMS
Hugh Chaplin (Irene Walter Johnson Inst. of Rehabilitation) *In its* Technol. and the Neurologically Handicapped 1974 p 55-72 (For availability see N75-19975 11-54)
CSCL 06B

The importance of objective measurements is discussed as a means of assessing the efficacy of physical and occupational therapy programs applied to patients recovering from neurological diseases. Considered are three primary categories of neurologically injured patients: patients with hemiplegia, patients with spinal cord injuries, and the heterogeneous group of cerebral palsy patients. Author

N75-19985* Duke Univ., Durham, N.C. Medical Center.
PROBLEMS AND PERSPECTIVES IN PARAPLEGIA
Blaine Nashold *In* NASA. Ames Res. Center Technol. and the Neurologically Handicapped 1974 p 73-82 (For availability see N75-19975 11-54)
CSCL 06B

Improved clinical treatment of the paraplegic, developed during World War II, has reduced the overall mortality rate from close to 100 percent to 30 percent. Despite major clinical improvements, mainly in treatment of the acute phase of paraplegia, and despite greater rehabilitation efforts, the spinal injured person is never rehabilitated in the sense that he reaches an optimum and stays there. He is always exposed to the constant threat of deterioration of his physiological, sociological, and psychological state. Author

N75-19986* California Univ., Davis. Dept. of Physical Medicine and Rehabilitation.
COPING WITH BRAIN DAMAGE c59
Worden Waring *In* NASA. Ames Res. Center Technol. and the Neurologically Handicapped 1974 p 83-92 (For availability see N75-19975 11-54)
CSCL 06B

Two neurological disorders, cerebral palsy, and traumatic brain damage as from an accident, are considered. The discussion covers the incidence of disabilities, their characteristics, and what is now being done to deal with them, particularly in reference to areas in which the capabilities of the engineer can be effectively applied. Author

N75-19987* Huntington Memorial Hospital, Pasadena, Calif.
BLINDNESS
Robert H. Pudenz *In* NASA. Ames Res. Center Technol. and the Neurologically Handicapped 1974 p 93-106 (For availability see N75-19975 11-54)
CSCL 06B

The possibilities are considered that modern electronics and engineering have to offer the individual with a damaged or disordered nervous system, especially the blind person. Discussed are the incidence and principal causes of blindness, past research activities, and a capsule review of some of the more interesting programs designed to provide the blind with the ability to be mobile in their environment and to read printed matter. Author

N75-19988* Massachusetts Inst. of Tech., Cambridge.
CYBERNETIC PROSTHESIS
Robert W. Mann *In* NASA. Ames Res. Center Technol. and the Neurologically Handicapped 1974 p 107-120 (For availability see N75-19975 11-54)
CSCL 06B

Design and development of a prosthetic device fitted to an above elbow amputee is reported that derives control information from the human to modulate power to an actuator to drive the substitute limb. In turn, the artificial limb generates sensory information feedback to the human nervous system and brain. This synergetic unity feeds efferent or motor control information from the human to the machine, and the machine responds, delivering afferent or sensory information back to the man. G.G.

N75-19989* Rancho Los Amigos Hospital, Inc., Downey, Calif.
THE CURRENT STATUS OF REHABILITATION ENGINEERING

James B. Reswick *In* NASA. Ames Res. Center Technol. and the Neurologically Handicapped 1974 p 121-128 (For availability see N75-19975 11-54)
CSCL 06B

Mechanical and electrical engineering devices for paralytic patient care are discussed as they are applied to medical problems. These include means of preventing bedsores, mobility aids, upper extremity orthoses, and electrical stimulation. G.G.

N75-19990* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EXOSKELETAL TECHNOLOGY
Hubert C. Vykukal *In its* Technol. and the Neurologically Handicapped 1974 p 129-140 (For availability see N75-19975 11-54)
CSCL 06B

Possible applications are considered of a master-sleeve teleoperator arm system, developed in exoskeletal space suit technology, as therapeutic aid, orthotic device, or for therapy on patients with neurological disorders. G.G.

N75-19991* Stanford Research Inst., Menlo Park, Calif. Bioinformation Systems Group.
ARTIFICIAL SENSORY SYSTEMS
James C. Bliss *In* NASA. Ames Res. Center Technol. and the Neurologically Handicapped 1974 p 141-150 (For availability see N75-19975 11-54)
CSCL 06B

Optical-tactile image conversion systems as reading aids for the blind, and teleoperator tactile displays for remotely controlled prosthetic braces are discussed. G.G.

N75-19992* Massachusetts Inst. of Tech., Cambridge.
MODELS OF THE VESTIBULAR SYSTEM AND POSTURAL CONTROL
Laurence R. Young and Alfred Weiss (Mass. Eye and Ear Infirmary) *In* NASA. Ames Res. Center Technol. and the Neurologically Handicapped 1974 p 151-168 (For availability see N75-19975 11-54)
CSCL 06B

Applications of control theory and systems analysis to the problem of orientation and posture control are discussed, with the possible long range goals of contributing to the development of hardware for rehabilitation of the handicapped. Author

N75-19993* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MANUAL CONTROL THEORY AND APPLICATIONS
Melvin Sadoff and Brian Repa (Michigan Univ., Ann Arbor) *In its* Technol. and the Neurologically Handicapped 1974 p 169-188 refs (For availability see N75-19975 11-54)
CSCL 06B

Control theory, including manual control theory, and a review of some previous physiological and neurological applications of control theory and associated engineering concepts are reported. The discussion includes a specially tailored battery of critical control tasks that are being developed to monitor astronaut performance in long term orbital flight. The application of these concepts and tasks to patients with various neurological disorders is considered. Author

N75-19994* Systems Technology, Inc., Inglewood, Calif.
NEUROLOGICAL APPLICATIONS OF MAN-MACHINE SYSTEMS ANALYSIS
Duane T. McRuer *In* NASA. Ames Res. Center Technol. and the Neurologically Handicapped 1974 p 189-204 (For availability see N75-19975 11-54)
CSCL 06B

Quantitative descriptions of human control properties are formulated that take into account the dynamics of muscle actuation units, neuromuscular sensor units, and sensory feedback mechanics. Detailed dynamic measurements on neurologically disordered patients are correlated with clinical manifestations of various neurological syndromes to quantify operator behavior. G.G.

N75-19995* Grumman Aerospace Corp., Bethpage, N.Y. Life Sciences Section.
NEW ENGINEERING SYSTEMS FOR MOBILITY
Thomas L. Keller and Allan Kelvin *In* NASA. Ames Res. Center Technol. and the Neurologically Handicapped 1974 p 205-218 (For availability see N75-19975 11-54)
CSCL 06B

Aerospace technology transfer and a systems integration approach are considered in the development of a transportation system for the handicapped. The basic vehicle design includes a slide-out boarding ramp and wheelchair accommodations. G.G.

N75-19996* General Electric Co., Philadelphia, Pa. Cybernetics Automation and Mechanization Systems Section.
CYBERNETIC ANTHROPOMORPHIC MACHINE SYSTEMS
Walter E. Gray *In* NASA. Ames Res. Center Technol. and the Neurologically Handicapped 1974 p 219-242 (For availability see N75-19975 11-54)
CSCL 06B

Functional descriptions are provided for a number of cybernetic man machine systems that augment the capacity of normal human beings in the areas of strength, reach or physical size, and environmental interaction, and that are also applicable to aiding the neurologically handicapped. Teleoperators, computer control, exoskeletal devices, quadruped vehicles, space maintenance systems, and communications equipment are considered. G.G.

N75-19997* Stanford Research Inst., Menlo Park, Calif. Artificial Intelligence Group.
THE ROLE OF INTELLIGENT MECHANICAL AIDS
John H. Munson *In* NASA. Ames Res. Center Technol. and the Neurologically Handicapped 1974 p 243-248 (For availability see N75-19975 11-54)
CSCL 06B

The general features and the controlling programs for a robot are explained, and its possible extension as aid to the neurologically handicapped is projected. G.G.

N75-19998* Massachusetts Inst. of Tech., Cambridge.
SUPERVISORY CONTROL SYSTEMS
Thomas B. Sheridan *In* NASA. Ames Res. Center Technol. and the Neurologically Handicapped 1974 p 249-262 (For availability see N75-19975 11-54)
CSCL 06B

The various functions of a computer are considered that serve in connecting the man, with his displays and controls, to an external environment, manipulator activators and the interoceptors that are in the actuators, and to the interosensors and the motors or the actuators to drive the sensors. Projected is an improved exoskeleton mechanism with computer control and some supervisory control that may give a quadriplegic the ability to walk and run around. G.G.

N75-19999# Danish Atomic Energy Commission, Risoe.
HUMAN DATA PROCESSOR AS A SYSTEM COMPONENT BITS AND PIECES OF A MODEL
J. Rasmussen May 1974 52 p refs Revised
(RISO-M-1722; R-8-74) Avail: ERDA Depository Libraries HC $5.75

During recent years the systems engineer designing control rooms for industrial process plants has been faced with complex human factors problems. In conventional control rooms the arrangement of meters, recorders, and control keys on the control desk and the choice of properly designed knobs and dials are the chief objectives for human factors consideration. The advent of computer-controlled display systems with the variety of modes for data conditioning and presentation available to support the operators calls for an integrated systems design. For information and results from another professional area to be identified and digested an interdisciplinary working hypothesis or reference frame is needed, and the present report describes such a preliminary model aiming at the support of future reading, discussions, and experiments. Author (NSA)

N75-20000# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
COMPARATIVE EVALUATION OF PROTOTYPE AND STANDARD FIRE FIGHTER'S SUITS UNDER COMBINED HYPERTHERMIC AND EXERCISE STRESS CONDITIONS

Abbott T. Kissen, Kenneth A. Smiles, Willi J. Buehring, Walter C. Summers, and David C. Smedley Aug. 1974 19 p refs
(AD-A002136; AMRL-TR-74-59) Avail: NTIS CSCL 06/17

Tests were conducted in the All Weather Test Facility to comparatively evaluate the standard fire proximity suit with a prototype assembly of half the weight. An exercise regimen of 20 minutes on the treadmill was superimposed on a prior resting exposure of 95 minutes to a hot-humid (36 C DB/ 33 C WB) environment. In terms of thermoregulatory, cardiovascular, and respiratory responses, the prototype and standard fire proximity suits impose similar penalties for the subject seated at rest. The standard assembly did, however, impose greater stress during the exercise portion of the test in terms of elevating heart rate and oxygen uptake. The environmental conditions were severe in that subjects approached tolerance. GRA

N75-19145* Michigan Univ., Ann Arbor. Highway Safety Research Inst.
AN EXPERIMENTAL STUDY OF THE MOTORCYCLE ROLL STABILIZATION TASK
David J. Eaton *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 233-243 refs (For availability see N75-19126 11-01)
CSCL 05H

N75-19163* Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
THE PREVIEW CONTROL PROBLEM WITH APPLICATION TO MAN-MACHINE SYSTEM ANALYSIS
Masayoshi Tomizuka and Daniel E. Whitney *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 429-441 refs (For availability see N75-19126 11-01)
(Grant NGR-22-009-002)
CSCL 05H

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N75-19986* California Univ., Davis. Dept. of Physical Medicine and Rehabilitation.
COPING WITH BRAIN DAMAGE
Worden Waring *In* NASA. Ames Res. Center Technol. and the Neurologically Handicapped 1974 p 83-92 (For availability see N75-19975 11-54)
CSCL 06B

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering.*

N75-20001# Royal Aircraft Establishment, Farnborough (England).
A METHOD OF PLOTTING GRAPHS IN APPARENT THREE-DIMENSIONAL FORM
G. L. Newland 5 Mar. 1974 27 p refs
(RAE-TM-IR-143; BR41184) Avail: NTIS HC $3.75

A method of plotting a trajectory on plain paper so that the successive points appear as a line in three dimensional space is described. For implementing this method, a digital computer and an incremental plotter are used. The method is applied for presentation of the relative position of a missile with respect to a target during the interception phase. The FORTRAN computer program is listed. ESRO

N75-20002# Royal Aircraft Establishment, Farnborough (England).
A TEKTRONIX GRAPHIC DISPLAY SYSTEM USING THE CONCEPTUAL MULTIPLEXER FACILITY OF GEORGE 3
G. Sharples May 1974 98 p refs
(RAE-TR-73178; BR41167) Avail: NTIS HC $4.75

A simple graphics facility has been added to an ICL 1904A computer. The software for obtaining a full 120 character set from the operating system George 3, a facility required by nearly all graphical devices (plotters, displays), is described. Use of this facility in the case of a Tektronix storage tube is discussed, and details of the implementation of the high level graphics package TEKPLOT are presented. Full documentation for all computer programs is given. ESRO

N75-20003# Cambridge Consultants Ltd. (England).
THE STATUS OF MEMORY TECHNOLOGIES UNDER DEVELOPMENT IN EUROPE AND THEIR USE IN SCIENTIFIC AND EARTH-RESOURCES OBSERVATION SATELLITES
D. A. Curtis Paris ESRO Dec. 1974 158 p
(Contract ESTEC-2127/73-HP)
(ESRO-CR-4716) Avail: NTIS HC $6.25

A comprehensive review of memory technologies under development and their application to space missions is presented. The characteristics of these technologies are analyzed with a view to their use in two representative spacecraft applications: the scientific satellite, which frequently requires data storage capacities up to 10 million bits, and an earth resources observation satellite, which can require data storage in excess of 10 gigabits. Technologies cover magnetic memories, beam-access systems and integrated circuit technologies. ESRO

N75-20004# Army Electronics Command, Fort Monmouth, N.J.
SHORT HAUL DIGITAL VHF TRANSMISSION STUDIES
George E. Krause, Robert L. Heyd, Jr., and Larry Levine Oct. 1974 79 p refs
(DA Proj. 1S7-62701-AH-92)
(AD-A001679; ECOM-4237) Avail: NTIS CSCL 17/2

The report characterizes VHF data channels over path distances of interest to Army tactical communicators. On-the-air tests were conducted over several non line-of-sight paths varying from 6.7 to 14.4 miles (10.8 - 23.2 km) in length. The digital transmission rates were 1.2 and 19.2 kilobits per second (k BPS). During several of the 1.2 k BPS tests, a 11.5 kHz tone was transmitted concurrently. A complete bit-by-bit history of the received digital transmissions was recorded on magnetic tape. The bits in error were determined from a knowledge of the transmitted signal. The report depicts error group distributions and bit error rate variations with path distance. A detailed examination of the variation in bit error rate during two occurrences of signal perturbation is made. GRA

N75-20005# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE TECHNICAL-ECONOMICAL EVALUATION OF CONTROL ELECTRONIC DIGITAL COMPUTERS
A. N. Rokhmistrov, B. K. Bondarenko, and E. V. Minko 5 Nov. 1974 21 p refs Transl. into ENGLISH from Tr. Leningrad. Inst. Aviats. Priborostr. (USSR), no. 56, 1968 p 23-34
(AD-A001849; FTD-MT-24-2114-74) Avail: NTIS CSCL 09/2

An economic evaluation model is examined. Primary attention is given to evaluation of the operating costs of the ETsVUM electronic control computer. A method is proposed using analytical calculations in combinations are given regarding the maintenance of operational reliability and decrease in expenditures on the ETsVUM. GRA

N75-20006# Stanford Univ., Calif. Dept. of Computer Science.
GEOMETRIC MODELING FOR COMPUTER VISION
Bruce Guenther Baumgart Oct. 1974 145 p refs
(Contract DAHC15-73-C-0435; ARPA Order 2494)
(AD-A002261; SU-STAN-CS-74-463; SU-AIM-249) Avail: NTIS CSCL 09/2

The main contribution of this thesis is the development of a three dimensional geometric modeling system for application to computer vision. In computer vision geometric models provide a goal for descriptive image analysis, an origin for verification image synthesis, and a context for spatial problem solving. Some of the design ideas presented have been implemented in two programs named GEOMED and CRE; the programs are demonstrated in situations involving camera motion relative to a static world. GRA

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N75-20007 Michigan Univ., Ann Arbor.
A MACRO-ORIENTED PROGRAMMING LANGUAGE EXTENSION FACILITY Ph.D. Thesis
Allen Lewis Springer 1974 391 p
Avail: Univ. Microfilms Order No. 74-25332

A macro style extension facility is described that is based upon a model of a conventional compiler that compiles a relatively simple predefined language. The compiler model has three phases: (1) the first phase is the lexical scan, whose output is a stream of descriptors representing variables, keywords, etc.; (2) the second phase contains the parse, interpretation of the parse and assignment of defaults to variables. Its output is a series of n-tuples, which are operators with zero or more operands, representing semantic primitives of the base language; and (3) the third phase generates code based upon the n-tuples. To form the extension facility, a macro processor is inserted between phase one and phase two, processing descriptors, and another macro processor is inserted between phase two and three, processing n-tuples. Dissert. Abstr.

N75-20008 California Univ., Davis.
RANDOM VIBRATION TEST CONTROL USING THE DIGITAL COMPUTER AND THE DISCRETE FOURIER TRANSFORM Ph.D. Thesis
Dennis Bruce Nelson 1974 147 p
Avail: Univ. Microfilms Order No. 74-29331

Random vibration test control is discussed in relation to the desired continuous process of discrete measurement and generation techniques using the FFT algorithm. Primary emphasis is placed on the generation of continuous signals via the inverse discrete Fourier transform. It is demonstrated that an almost-normal random signal with a prescribed spectrum may be generated using the concept of summing harmonically related, randomly phased sinusoids via the inverse FFT. The frequency selectivity of the signal is shown to depend strictly on the manner in which the discrete results of the inverse FFT are combined to form the required continuous signal. It is shown that by windowing and overlapping discretely generated segments a signal with the desired characteristics may be formed. Dissert. Abstr.

N75-20009 Wisconsin Univ., Madison.
HARMONIC TUNING AND INSTABILITIES IN IMPATT DIODE OSCILLATORS Ph.D. Thesis
Hans Andreas Kvinlaug 1974 187 p
Avail: Univ. Microfilms Order No. 74-19560

An investigation was made of an IMPATT diode oscillator both theoretically and experimentally, and also by a simulation on a hybrid computer. Emphasis was placed on studying IMPATT diode-circuit interaction, in particular, harmonic tuning and low frequency bias circuit oscillations. The results obtained with harmonic tuning have confirmed earlier studies which showed large increases in output power at frequencies below the optimum power output frequency. However, the increase in output power reported at frequencies above the optimum power output frequency was not seen. For low frequency bias circuit oscillations, a new stability criterion was derived which could predict precisely the signal level and frequency at which the instability would occur. For some bias circuit arrangements this stability criterion predicted results which contradict previously held beliefs. Dissert. Abstr.

N75-20010# Joint Publications Research Service, Arlington, Va.
GAUGING COMPUTER TIME EFFECTIVENESS
S. Tonkovich 20 Jan. 1975 10 p Transl. into ENGLISH from Promyshlennost' Belorussii (Minsk), no. 2, Feb. 1972 p 60-61
(JPRS-63908) Avail: NTIS HC $3.25

Calculations are given for setting standards for the costs of a machine-hour of computer operation. Author

N75-20011*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
DETAILED REQUIREMENTS DOCUMENT FOR COMMON SOFTWARE OF SHUTTLE PROGRAM INFORMATION MANAGEMENT SYSTEM
J. M. Everette, L. D. Bradfield, and C. L. Horton Feb. 1975 67 p refs
(Contract NAS9-12200)
(NASA-CR-141709; LEC-5479; JSC-09380) Avail: NTIS HC $4.25 CSCL 09B

Common software was investigated as a method for minimizing development and maintenance cost of the shuttle program information management system (SPIMS) applications while reducing the time-frame of their development. Those requirements satisfying these criteria are presented along with the stand-alone modules which may be used directly by applications. The SPIMS applications operating on the CYBER 74 computer, are specialized information management systems which use System 2000 as a data base manager. Common software provides the features to support user interactions on a CRT terminal using form input and command response capabilities. These features are available as subroutines to the applications. Author

N75-20012# Sydney Univ. (Australia). Dept. of Aeronautical Engineering.
AUTOMATIC GENERATION OF FINITE ELEMENTS
Grant P. Steven Sep. 1974 28 p refs
(ATN-7405) Avail: NTIS HC $3.75

A method is described for the automatic generation of finite element triangles, wholly within the computer, using the minimum amount of input data. The region for subdivision may be a two or three dimensional surface of arbitrary geometry. An isoparametric transformation is used to give a regular rectangle from any curvilinear quadrilateral zone within the total domain. This rectangle can be easily subdivided into triangles which are then retransformed to the original coordinates. Care was taken to ensure that the mesh generated as described herein embodies most of the characteristics required by the finite element technique in the subsequent solution of some field problem. Author

N75-20013*# M&S Computing, Inc., Huntsville, Ala.
VORTEX INFORMATION DISPLAY SYSTEM PROGRAM DESCRIPTION MANUAL
R. Conway, G. N. Matuck, J. M. Roe, J. Taylor, and A. Turner 11 Feb. 1975 249 p
(Contract NAS8-25621)
(NASA-CR-120703; Rept-75-0004) Avail: NTIS HC $7.50 CSCL 09B

A vortex information display system is described which provides flexible control through system-user interaction for collecting wing-tip-trailing vortex data, processing this data in real time, displaying the processed data, storing raw data on magnetic tape, and post processing raw data. The data is received from two asynchronous laser Doppler velocimeters (LDV's) and includes position, velocity, and intensity information. The raw data is written onto magnetic tape for permanent storage and is also processed in real time to locate vortices and plot their positions as a function of time. The interactive capability enables the user to make real time adjustments in processing data and provides a better definition of vortex behavior. Displaying the

vortex information in real time produces a feedback capability to the LDV system operator allowing adjustments to be made in the collection of raw data. Both raw data and processing can be continually upgraded during flyby testing to improve vortex behavior studies. The post-analysis capability permits the analyst to perform in-depth studies of test data and to modify vortex behavior models to improve transport predictions. Author

N75-20014*# Kanner (Leo) Associates, Redwood City, Calif.
EFFECT OF THE MAGNETIC FIELD ON THE DIRECTIONAL BEHAVIOR OF GOLDFISH
Guenther Becker Washington NASA Mar. 1975 7 p refs Transl. into ENGLISH from Naturwissenschaften (West Ger.), v. 61, pt. 5, 1974 p 220-221
(Contract NASw-2481)
(NASA-TT-F-16207) Avail: NTIS HC $3.25 CSCL 06C

Several fish were found able to perceive the earth's magnetic field and to use it as a direction finder both during quiescent state and when shocked. An artificially reduced field was found to have the same effect. Characteristics of this behavior are discussed. Author

N75-20015# Kernforschungsanlage, Juelich (West Germany). Zentralinst. fuer Angewandte Mathematik.
SYMMETRICAL WILF QUADRATURE FORMULAS
H. Engels and U. Eckhardt Aug. 1974 26 p In GERMAN, ENGLISH summary
(JUL-1094-MA) Avail: ERDA Depository Libraries HC $4.25

Using a new characterization for WILF quadrature formulae given by Engels, these formulae are computed for an interval up to 32 nodes with 25 significant digits. A description is given on how to perform the calculation of nodes and weights of these formulae. Nodes and weights as well as FORTRAN-subroutines for WILF-quadrature are listed, which can be implemented immediately. Author (NSA)

N75-20016# Kernforschungszentrum, Karlsruhe (West Germany).
DYNAMIC DATA BLOCK MANAGEMENT IN FORTRAN
U. Schumann Aug. 1974 34 p refs In GERMAN; ENGLISH summary
(KFK-EXT-8/74-2) Avail: ERDA Depository Libraries HC $4.75

A subprogram package is made available for the dynamic management of large data sets in FORTRAN programs. This allows storage of those data that do not fit into the main core memory in an external direct access data file. The subprogram package expects the data set to be subdivided into blocks of equal lengths. Individual subprogram entries allow space in core memory to be made available for a new block or for an earlier used block. Blocks are not moved until they are released or deleted by call of some other subprogram entries. The subprogram package automatically transfers previously released blocks to the external file if the space in the core memory is not sufficient for blocks to be newly made available. It is assumed that the blocks are processed in a cyclic sequence; hence, the block released last will be removed first. The subprogram package is programmed in FORTRAN 4 and ASSEMBLER for application in FORTRAN programs. Author (NSA)

N75-20017# California Univ., Livermore. Lawrence Livermore Lab.
APL LANGUAGE AS A POWERFUL ENGINEERING DESIGN TOOL
J. P. McKay 30 Oct. 1974 14 p refs Presented at the CUBE Symp., Livermore, Calif., 22-25 Oct. 1974 Sponsored by ERDA
(UCRL-76150; Conf-741001-20) Avail: NTIS HC $3.25

APL is a high level language that affords enormous time savings in computer programming and debugging at all levels of problem sophistication. Using APL as a super calculator, the novice can solve complicated algebraic expressions after only a few hours of instruction and practice. APL can also be learned a piece at a time without the user having to be concerned about inadvertently causing the system to bomb. Many engineers who should be using computers have been turned off by their initial, unpleasant experiences in handling input-output. Yet in APL, input-output problems, the biggest single barrier to achieving proficiency in FORTRAN, are practically nonexistent. Also, design problems that require only an hour or two on a desk calculator, but have to be repeated more than once or twice, can be programmed advantageously in APL. Author (NSA)

N75-20018# Argonne National Lab., Ill.
USE OF THE ARGONNE BENCHMARK COLLECTION TO MEASURE COMPUTER SYSTEM PERFORMANCE
M. K. Butler and A. Hirsch Sep. 1974 201 p
(Contract W-31-109-eng-38)
(ANL-8127) Avail: NTIS HC $7.25

To measure the performance of fast, large computing systems against a standard system a two-part benchmark collection was prepared. One part consists of production codes selected as being representative of the research and reactor development programs. These jobs are run individually to measure the performance multiplier for particular classes of work and together in a multiprogrammed environment to test the interference between jobs. The other part consists of jobs extracted from the daily workload experienced by the computer center. These jobs are run as a model job stream in a multiprogrammed environment to measure the throughput multiplier. The performances of compilers and system utilities are measured. This report presents the results of an experiment using the benchmark collection to measure the performance of a CDC 7600 and an IBM 360/195 as part of a computer acquisition study. Problems encountered in converting to and running the benchmark collection on their configurations are discussed. Author (NSA)

N75-20019# Aerojet Nuclear Co., Idaho Falls, Idaho. National Reactor Testing Station.
SOFTWARE DEVELOPED FOR THE RADIATION COUNTING LABORATORY AT THE NASA MANNED SPACECRAFT CENTER
R. C. Davies 1973 10 p refs Presented at the DECUS Spring Symp., Philadelphia, 2 May 1973 Sponsored by ERDA
(Conf-730536-3) Avail: NTIS HC $3.25

A background/foreground data acquisition and analysis system incorporating a high level control language was developed for the Radiation Counting Laboratory at the NASA Manned Spacecraft Center. The system supports acquisition of gamma-ray spectra in a 256 x 256 coincidence matrix (utilizing disk storage) and simultaneous operation of any of several background support and data analysis functions. In addition to special instruments and interfaces, the hardware consists of a PDP-9 with 24K core memory, 256K words of disk storage, and DECtape and Magtape bulk storage. Author (NSA)

N75-20020# Stanford Univ., Calif.
SYSTEMS OPTIMIZATION PROJECT, APPENDIX Progress Report, 1 Oct. 1973 - 30 Jul. 1974
G. B. Dantzig, R. W. Cottle, B. C. Eaves, and R. B. Wilson 1974 59 p refs
(Contract AT(04-3)-326)
(SU-326-P18-X8-App) Avail: NTIS HC $4.25

A summary of computational work and software development for structured linear programming, general linear programming, quadratic programming and linear complementarity, and general nonlinear programming is presented. Twelve abstracts to papers pertaining to the data are presented and then bibliographic data are presented for the authors. NSA

N75-20021# Sandia Labs., Albuquerque, N.Mex.
ACCESS CATALOGING SYSTEM FOR COMPUTER PROGRAMS
W. A. VonRiesemann and J. A. Allensworth 1974 6 p refs Presented at the CUBE Symp., Livermore, Calif., 23 Oct. 1974 Sponsored by ERDA
(SAND-74-5569; Conf-741001-25) Avail: NTIS HC $3.25

The ACCESS is a central reference system to structural mechanics programs at Sandia Laboratories. The primary objectives of the system are to provide quick identification of available programs, to furnish all needed information for their use, and to maintain the programs properly. This latter point includes identifying a sponsor for each program, defining standards and procedures for writing and issuing of manuals, and establishing guidelines for checking out programs. The ACCESS consists of a cross-referenced index of available programs, and for each program an abstract, a code description sheet, and documentation

all filed at one central location. Depending on its status, a program is either available from the permanent files on the CDC-6600, or from an ACCESS magnetic tape in UPDATE form. Due to time and manpower restraints there are several problems in the working of the system, mainly in keeping the status of programs up to date, in checking out programs, and in writing users manuals. Author (NSA)

N75-20022# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computing.
A SYNTAX CHECKER FOR ALGOL 60
B. A. Wichmann Aug. 1974 48 p refs
(NPL-NAC-53) Avail: NTIS HC $3.75

A syntax-checker program, requiring a very small data area, written in ALGOL 60, and having all machine dependencies carefully isolated is described. The program can be used for checking algorithms for publication, checking programs on a front-end minicomputer before being submitted for batch execution elsewhere, and checking algorithms converted from FORTRAN, when no ALGOL compiler exists, in this case recording the checker in some other language. ESRO

N75-20023# Stanford Univ., Calif. Dept. of Computer Science.
RECENT RESEARCH IN ARTIFICIAL INTELLIGENCE, HEURISTIC PROGRAMMING, AND NETWORK PROTOCOLS
Lester Earnest, ed. Jul. 1974 76 p refs
(Contract DAHC15-73-C-0435)
(AD-A002246; SU-STAN-CS-74-466; SU-AIM-252) Avail: NTIS CSCL 09/2

This is a progress report for ARPA-sponsored research projects in computer science for the period July 1973 to July 1974. Accomplishments are reported in artificial intelligence (especially heuristic programming, robotics, theorem proving, automatic programming, and natural language understanding), mathematical theory of computation, and protocol development for computer communication networks. References to recent publications are provided for each topic. GRA

N75-20024# Stanford Research Inst., Menlo Park, Calif.
SOFTWARE DEVELOPMENT FOR DECISION ANALYSIS Semiannual Technical Report, 1 Mar. - 1 Nov. 1974
Allen C. Miller, III Nov. 1974 13 p refs
(Contract MDA903-74-C-0240; DARPA Order 2742; SRI Proj. 3309)
(AD-A001813) Avail: NTIS CSCL 09/2

This research effort has two objectives: Task A - Develop a morphology for characterizing and analyzing decision problems to serve as a basis for the design of a system of integrated computer aids for decision making; Task B - Transfer the existing SRI CTREE program to two computers, one available for classified work in the Washington, D. C. area and one accessible through the DARPA computer network. GRA

N75-20025# Army Electronics Command, Fort Monmouth, N.J.
EQUIPMENT WIRING ANALYSIS PROGRAMS Final Report
Paul Kushisaki and Ivan N. Zoltan Nov. 1974 84 p refs
(DA Proj. 1S7-62701-AH-92)
(AD-A002012; ECOM-4275) Avail: NTIS CSCL 09/2

A sequented computer program is presented which is designed to provide up-to-date aid to the logic designer. Bookkeeping tasks during the equipment design phase are performed and checked by the programs. The aim of the programmer is to provide inexpensive, rapid, up-to-date information to the design engineer. The description of the system is followed by a practical example to illustrate the effectiveness of the developed programs to demonstrate the man-to-machine interactions required to operate the system. GRA

N75-20026*# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
ON THE EFFICIENT COMPUTATION OF RECURRENCE RELATIONS Final Report
Dow E. Heller 13 Jun. 1974 7 p refs
(Grant NGR-47-102-001; Contract N00014-67-A-0314-0010; Grant NSF GJ-32111; NR Proj. 044-422)
(NASA-CR-136766; AD-A002248) Avail: NTIS HC $3.25 CSCL 09/2

A new parallel algorithm for the solution of a general linear recurrence is described. Its relation to the work of Kogge and Stone is discussed. GRA

N75-20027# University of Southern Calif., Marina del Rey. Information Sciences Inst.
AN INTERACTIVE PROGRAM VERIFICATION SYSTEM
Donald I. Good (Texas Univ., Austin), Ralph L. London, and W. W. Bledsoe (Texas Univ., Austin) Oct. 1974 32 p refs
(Contract DAHC15-72-C-0308; Grants NSF GJ-36424; NSF GJ-32269; ARPA Order 2223)
(AD-A002279; ISI/RR-74-22) Avail: NTIS CSCL 09/2

This paper is an initial progress report on the development of an interactive system for verifying that computer programs meet given formal specifications. The system is based on the conventional inductive assertion method: given a program and its specifications, the object is to generate the verification conditions, simplify them, and prove what remains. This system addresses two aspects of software improvement of extreme importance to the military: increase in the quality of software and decrease in the cost of producing high-quality software. A general description is given of the overall design philosophy, structure, and functional components of the system, and a simple sorting program is used to illustrate both the behavior of major system components and the type of user interaction the system provides. GRA

N75-20028# Maryland Univ., College Park. Dept. of Computer Science.
STRUCTURED PROGRAMMING AND COMPILING IN A MINICOMPUTER ENVIRONMENT
David L. Mills Oct. 1974 70 p refs
(Contract N00014-67-A-0239-0032; Grant NSF GK-41602)
(AD-A002288; TR-339) Avail: NTIS CSCL 09/2

This report describes a structured programming language and compiler designed for systems implementation use in a minicomputer environment. The language, called ULP, is designed to be easily translated by a small compiler, yet maintain the philosophy of structured-programming. The structure of the language is defined by a set of macro definitions which can be easily changed to fit a number of computers or to extend the operation and statement repertoire of the language. The compiler itself is small and extensively table driven, factors which enhance its portability and applicability in small-system environments. The compiler has been implemented in FORTRAN for both the System/370 and the Univac 1106 and in its own language for the PDP11. The compiler can compile itself in a PDP11 with 12K of storage and produce object programs of similar size and efficiency as SIMPL. GRA

62 COMPUTER SYSTEMS

Includes computer networks.

N75-20029 Polish Academy of Sciences, Warsaw.
ENCYCLOPEDIC INFORMATION ABOUT DIGITAL MACHINES [ENCYKLOPEDYCZNE WIADOMOSCI O MASZYNACH CYFROWYCH]
Jerzy Miescicki 9 Jun. 1974 119 p In POLISH
(Rept-50/1974) Avail: Issuing Activity

Information theory and generalized principles of data processing are discussed along with algorithms, programming languages, and computer programs. Other topics discussed include digital data, analog data, data storage, digital system, coding, relative numbers, core storage, computer storage devices, data transmission channels, and binary data. Transl. by M.J.S.

N75-20030*# Massachusetts Inst. of Tech., Cambridge. Instrumentation Lab.
ANALYSIS OF A MULTIPROCESSOR GUIDANCE COMPUTER Ph.D. Thesis
Efrem G. Maltach Jun. 1969 118 p refs
(Contract NAS9-4065)
(NASA-CR-141712; T-515) Avail: NTIS HC $5.25 CSCL 09B

The design of the next generation of spaceborne digital computers is described. It analyzes a possible multiprocessor computer configuration. For the analysis, a set of representative space computing tasks was abstracted from the Lunar Module Guidance Computer programs as executed during the lunar landing, from the Apollo program. This computer performs at this time about 24 concurrent functions, with iteration rates from 10 times per second to once every two seconds. These jobs were tabulated in a machine-independent form, and statistics of the overall job set were obtained. It was concluded, based on a comparison of simulation and Markov results, that the Markov process analysis is accurate in predicting overall trends and in configuration comparisons, but does not provide useful detailed information in specific situations. Using both types of analysis, it was determined that the job scheduling function is a critical one for efficiency of the multiprocessor. It is recommended that research into the area of automatic job scheduling be performed. Author

N75-20031# Computer Corp. of America, Cambridge, Mass.
DATACOMPUTER PROJECT TECHNICAL REPORT
28 Feb. 1974 101 p
(Contract DAHC04-71-C-0011; ARPA Order 1731)
(AD-A002083) Avail: NTIS CSCL 09/2

The datacomputer system is being designed as a large-scale data storage utility to be accessed from remote computers on the Arpanet and, potentially, on other networks. The development is phased, with each successive release of the system offering increased capabilities to users. During the present reporting period, the second release of the system became operational. This release, while still primitive in many respects, is beginning to provide experience with actual applications and user programs. GRA

N75-20032# Auburn Univ., Ala. Engineering Experiment Station.
A STUDY OF FAULT DIAGNOSIS OF SEQUENTIAL LOGIC NETWORKS Final Report, 1 Dec. 1971 - 31 Oct. 1974
B. D. Carroll 31 Oct. 1974 26 p refs
(Grants DA-ARO(D)-31-124-72-G68;
DA-ARO(D)-31-124-72-G147)
(AD-A001831; ARO-10372.7-EL) Avail: NTIS CSCL 09/2

The research conducted on this project was concerned with the problem of test pattern generation for sequential logic circuits. More specifically, an algorithm was sought for generating test patterns for detecting single stuck-at faults in synchronous sequential circuits containing clocked flip-flop memory elements. In addition to the principal problem stated above, the related problems of test pattern generation for combinational iterative logic arrays and of test pattern generation for multiple faults in combinational logic circuits were also studied. A summary of the results obtained and the conclusions reached on the above problems is given. Suggestions for follow-on studies are discussed. Reprints of all papers published on the project are included in an appendix. GRA

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N75-20033 Stanford Univ., Calif.
AN ENVIRONMENT AND SYSTEM FOR MACHINE UNDERSTANDING OF CONNECTED SPEECH Ph.D. Thesis
Lee Daniel Erman 1974 172 p
Avail: Univ. Microfilms Order No. 74-27012

A description is given of part of the research which led to the development of the first demonstrable live system for machine understanding of connected speech: the HEARSAY system. This system uses syntactic, semantic, and contextual information, as well as the more traditional domains of acoustic-phonetic, phonological, and lexical knowledge, in order to recognize and understand utterances. The efforts involved fall into two classes: (1) the design and implementation of the HEARSAY system itself and (2) the careful construction of an environment within which research in machine perception of speech may be pursued by a number of researchers over a period of years. This consideration for an evolving experimental environment is a prime motivation and direction of the work. Thus, the system itself is viewed as a tool for on-going experimentation. Dissert. Abstr.

N75-20034 Stanford Univ., Calif.
ON THE OPTIMAL CONTROL OF SINGLE SERVER QUEUEING SYSTEMS Ph.D. Thesis
Frank Curry Reed 1974 263 p
Avail: Univ. Microfilms Order No. 74-27092

A general approach to determining optimal dynamic control policies for single server queueing systems is discussed. The approach is applicable to the minimization of both long-run expected average cost per unit time and of expected total discounted cost over an infinite horizon. Since the cost structure involves unbounded costs, sufficient conditions were developed for the existence of stationary optimal policies and the optimality of stationary policies in Markov decision processes with unbounded costs. The discounted or relative cost function was obtained by solving an appropriate system of difference equations. The policy improvement algorithm was applied parametrically leading to a characterization of the cost function satisfying the functional equation of optimality. For the average cost case it is shown that either the queueing system is operated continuously or the queue is shut down whenever the system is empty and restarted whenever the number of customers reaches or exceeds a critical integer N greater than or equal to 0. Dissert. Abstr.

N75-20035 Colorado State Univ., Fort Collins.
INCORPORATION OF SPATIAL FREQUENCY ANALYSIS AS ADDITIONAL FEATURES FOR MULTISPECTRAL LAND USE CLASSIFICATION Ph.D. Thesis
Richard J. Hornung 1974 170 p
Avail: Univ. Microfilms Order No. 74-27951

Spatial pattern recognition techniques are incorporated with multispectral classification of imagery. Automatic interpretation and classification of images by use of the Fourier domain in conjunction with spectral information is investigated. Different sampling is investigated. Different sampling strategies of the transform frequency space, cross-channel relationships, and aperture geometries were studied. Channels in the visible portion of the spectrum generally provide the same spatial information except when temporal, meteorological, climate and mission characteristics have a profound effect on a particular classification category. Thermal IR channels also provide important spatial as well as spectral information in some instances. Dissert. Abstr.

N75-20036# Lockheed Missiles and Space Co., Palo Alto, Calif.
BINARY CONVOLUTIONAL CODES, CHAPTER 2
K. Sh. Zigangirov [1975] 12 p ref Transl. into ENGLISH from the book "Protsedury Posledovatelnogo Dekodirovaniia" Moscow, SVIAZ, 1974 p 15-27
Avail: NTIS HC $3.25; National Translations Center, John Crerar Library, Chicago, Illinois 60616

The most important characteristic of a convolutional code is the minimum spacing between code sequences. The bounds for the existence of the minimum spacing are obtained. Although these results are not used directly in the exposition of the sequential decoding questions in the subsequent chapters, it is necessary to know them for the construction of convolutional codes. The problem of selecting good convolutional codes is not separable from the problem of constructing a sequential decoder. Author

N75-20037# National Aerospace Lab., Tokyo (Japan).
A DESIGN METHOD OF OPTIMAL REDUCED ORDER OBSERVER WITH ADJUSTABLE STABILITY
Nagakatsu Kawahata Aug. 1974 25 p refs In JAPANESE; ENGLISH summary
(NAL-TR-381) Avail: NTIS HC $3.25

Provided is a method of design for an optimal reduced order observer to minimize the cost increase with respect to an identified minimal set of independent observer design parameters. The optimal reduced order observer obtained by this method may have a strong plant-observer dynamic coupling because of the so-called separation theorem. Hence, the resulting closed loop system dynamics might largely differ from the dynamics of optimal

system with the complete state feedback (the system to be implemented). The main objective of this paper is to let the optimal reduced order observer have a guaranteed stability so that the dynamics of the optimal system to be implemented are not altered by the insertion of the observer in the feedback channel. A newly introduced scalar parameter to adjust the observer stability plays the role of trade-off between the minimum cost increase and the essential bandwidth of the observer. Every other observer design parameter can be determined as a function of the scalar parameter. Author

N75-20038# Michigan Univ., Ann Arbor. Dept. of Aerospace Engineering.
CONTROL SYSTEM STABILITY ANALYSIS AND OPTIMIZATION TECHNIQUES Final Scientific Report, 1 Jun. 1973 - 31 Aug. 1974
Elmer G. Gilbert Aug. 1974 12 p refs
(Grant AF-AFOSR-2517-73; AF Proj. 9769)
(AD-A001921; AFOSR-74-1878TR) Avail: NTIS CSCL 12/1

The research concerned the control of dynamic systems and was in two main areas: (1) stability conditions for nonlinear feedback systems, (2) optimization of control systems with emphasis on computational questions. The principal results of the research are the following: (1) a set of conditions for the stability of a multi-loop feedback system involving two time-invariant dynamic systems and two memoryless nonlinearities, (2) a mathematical theory for the numerical solution of vector two-point-boundary-value problems of the type obtained from necessary conditions for optimal controls, (3) the development of effective, user-oriented computer programs based on this theory and the results of numerical experiments, (4) a comprehensive theory of optimal periodic control systems. GRA

N75-20039# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
NEW PROGRESS IN ARTIFICIAL INTELLIGENCE Annual Progress Report, Jan. 1972 - Jun. 1974
Patrick H. Winston Jun. 1974 351 p refs
(Contracts N00014-70-A-0003; N00014-70-A-0005; Grants NSF EC-1049; NSF EC-40708)
(AD-A002272; AI-TR-310) Avail: NTIS CSCL 06/4

This report concentrates on progress during the last two years at the M.I.T. Artificial Intelligence Laboratory. Topics covered include the representation of knowledge, understanding English, learning and debugging, understanding vision and productivity technology. It is stressed that these various areas are tied closely together through certain fundamental issues and problems. GRA

N75-20040# Aerospace Corp., El Segundo, Calif. Engineering Science Operations.
BAYESIAN RECURSIVE ESTIMATION WITH SAMPLED IR DATA
Kenneth K. Wong 30 Sep. 1974 10 p refs
(Contract F04701-74-C-0075)
(AD-A002690; TR-0075(5901-02)-6; SAMSO-TR-74-257) Avail: NTIS CSCL 09/4

A Bayesian nonlinear filter is presented for sampled infrared (IR) sensor data processing. The filter estimates the position of the noise-corrupted target signal located within the sensor's field of view. The filter is optimal in the sense of minimizing the mean-square estimation errors. Monte Carlo simulation results are presented. The results show that the filter works well even under very low signal-to-noise ration (SNR) conditions. GRA

N75-20041# Linkabit Corp., San Diego, Calif.
FEEDBACK COMMUNICATIONS Final Report
1 Oct. 1974 79 p refs
(Contract N00123-74-C-0489)
(AD-A002284) Avail: NTIS CSCL 09/4

The objectives of the present contract are two-fold. First, to study the application of the block coding version of multiple repetition coding (MRC) in a duplex (noisy feedback) situation. Second, to finish the theoretical analysis of the recursive coding version of MRC, i.e., to determine the error correcting capabilities of the binary recursive signalling scheme. GRA

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N75-20042# Stanford Univ., Calif. Dept. of Computer Science.
SOLUTION OF LARGE, STRUCTURED LINEAR COMPLEMENTARITY PROBLEMS, 3
R. W. Cottle, G. H. Golub, and R. S. Sacher Jun. 1974 90 p refs
(Contract AT(04-3)-326)
(SU-326-P30-32; TR-74-7) Avail: NTIS HC $4.75

A general linear complementarity problem is considered in which the matrix is not necessarily tridiagonal but may be block tridiagonal. It is assumed to be Minkowski, in which M may be partitioned into submatrices M sub ij (i, j = 1, 2,...,m) such that M sub ii is a Minkowski matrix of order n sub i = 1, 2, ..., m; M sub ij smaller than or equal to 0 (elementwise) if i diagonal j; M has positive principal minors; and M sub ij = 0 if (i - j) greater than 1. Matrices satisfying the last condition alone are known as block tridiagonal matrices. NSA

N75-20043# Illinois Univ., Urbana. Dept. of Computer Science.
MULTIRATE METHODS FOR ORDINARY DIFFERENTIAL EQUATIONS
C. W. Gear Sep. 1974 12 p
(Contract AT(11-1)-2383)
(COO-2383-0014; UIUCDCS-F-74-880) Avail: NTIS HC $3.25

Multirate methods have often been considered for integrating systems in which one part changes much more rapidly than another, but little theoretical study has been made on the accuracy and stability of such methods. These comments suggest some of the problems that might be involved, and some ways in which the methods can be analyzed. Author (NSA)

N75-20044# Los Alamos Scientific Lab., N.Mex.
SURFACES OF REVOLUTION WITH VARIOUS NORMAL INTERSECTION PROPERTIES
C. J. Everett and S. R. Orr Sep. 1974 8 p refs Sponsored by ERDA
(LA-5742-MS) Avail: NTIS HC $3.25

The way in which the normals to a surface of revolution intersect the axis of symmetry is of interest both mathematically and physically. Those surfaces for which the intersection point has certain specified properties of distance, or of uniformity, are determined. Some of these properties determine the central conics, while others lead to generating curves apparently new. Routines are included for determining the polar coordinates of those that are ellipse like and, hence, relevant to design. Author (NSA)

N75-20045# Stanford Univ., Calif. Dept. of Computer Science.
ALGORITHMS FOR SEPARABLE NONLINEAR LEAST SQUARES PROBLEMS
A. Ruhe and P. A. Wedin Jul. 1974 51 p refs
(Contract AT(40-3)-326)
(SU-326-P30-31) Avail: NTIS HC $4.25

Iterative algorithms of Gauss-Newton type for the solution of nonlinear least squares problems are considered. They separate the variables into two sets, in such a way that in each iteration, optimization with respect to the first set is performed first, and corrections to those of the second after that. The linear-nonlinear case, where the first set consists of variables that occur linearly, is given special attention, and a new algorithm is derived that is simpler to apply than the variable projection algorithm as described by Golub and Pereyra, and can be performed with no more arithmetical operations than the unrestricted Gauss algorithm. A detailed analysis of the asymptotical convergence properties of these three algorithms is performed, and it is found that they have comparable rates of convergence, and all converge almost quadratically for almost compatible problems, as opposed to simpler separation schemes that always converge only linearly. Author (NSA)

N75-20046# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computing.
SAFEGUARDED STEPLENGTH ALGORITHMS FOR OPTIMIZATION USING DESCENT METHODS
Philip E. Gill and Walter Murray Aug. 1974 37 p refs
(NPL-NAC-37) Avail: NTIS HC $3.75

A relatively complex algorithm, in terms of number of instructions, capable of minimizing sufficiently difficult functions using the descent method, was derived. The exact univariate minimization problem is discussed, including methods utilizing function comparison, safeguarded successive approximation schemes, finding the initial interval of uncertainty, non-unimodal functions, and convergence criteria. Steplength algorithms based on safeguarded polynomial approximation are presented. ESRO

N75-20047# Minnesota Univ., Minneapolis. Dept. of Aerospace Engineering and Mechanics.
METHODS OF ANALYSIS DIFFERENTIAL EQUATIONS AND THEIR APPLICATIONS TO GYROSCOPIC SYSTEMS Final Report, 1 Apr. 1972 - 31 Aug. 1974
P. R. Tethna Nov. 1974 12 p refs
(Grant AF-AFOSR-2284-72; AF Proj. 9749)
(AD-A001940; AFOSR-74-1794TR) Avail: NTIS CSCL 12/1

The report describes the work accomplished under the grant. The work covers five publications, some of which advance previous mathematical methods of analysis and others apply the methods to problems of physical importance and in particular to problems associated with gyroscopic systems. GRA

N75-20048# North Carolina Univ., Chapel Hill. Dept. of Statistics.
LECTURES ON RANDOM MEASURES
Olav Kallenberg Nov. 1974 183 p refs Prepared in cooperation with Goteborg Univ., Sweden
(Contract N00014-67-A-0321-0002; NR Proj. 042-214)
(AD-A001796; Mimeo-Ser-963) Avail: NTIS CSCL 12/1

This work contains a description of the basic framework, and many of the more important structural properties of random measures and point processes. The aim has been to give a general treatment of known results together with a description of recent research in this field. GRA

N75-20049# Naval Research Lab., Washington, D.C.
NUMERICAL EVALUATION OF OSCILLATORY INTEGRALS WITH SPECIFIC APPLICATION TO THE MODIFIED BESSEL FUNCTION (K SUB i, ZETA) (x) Final Report
Jay P. Boris and Elaine S. Oran Oct. 1974 28 p refs
(DNA Proj. NWED-QAXH)
(AD-A002197; NRL-MR-2925) Avail: NTIS CSCL 12/7

The authors present an orthogonalized Fourier method for the numerical evaluation of oscillatory integrals which have an infinite range of integration. This method in contrast to others which have been developed, attains maximum efficiency in the limit of rapid oscillations. The results are compared to those obtained from a Gaussian integration scheme and the Shanks acceleration of the Gaussian results. Special attention is given to the evaluation of the modified Bessel Function (K sub i, zeta) (x). GRA

N75-20050# Houston Univ., Tex. Dept. of Mathematics.
ALGORITHMS FOR EIGENVALUE-EIGENVECTOR PROBLEMS FOR NONNORMAL MATRICES Final Scientific Report
W. L. Morris Nov. 1974 30 p
(Grant AF-AFOSR-2466-73; AF Proj. 9749)
(AD-A001914; AFOSR-74-1876TR) Avail: NTIS CSCL 12/1

This is the final report for Grant AFOSR 73-2466, 1 Sep. 72 through 31 Aug. 74. This report consists of FORTRAN listings of SUBROUTINES SEIGEN and NEIGEN. SUBROUTINE SEIGEN computes approximate eigenvalues and eigenvectors of real symmetric matrices along with rigorous bounds on the relative error; SUBROUTINE NEIGEN does the same computation for complex normal matrices. GRA

N75-20051# California Univ., Los Angeles. Dept. of System Sciences.
IDENTIFICATION-INVERSE PROBLEMS FOR PARTIAL DIFFERENTIAL EQUATIONS: A STOCHASTIC FORMULATION
A. V. Balakrishnan 1974 15 p refs
(Grant AF-AFOSR-2492-73; AF Proj. 9769)
(AD-A001933; AFOSR-74-1754TR) Avail: NTIS CSCL 12/1

This paper presents a stochastic formulation of a class of identification problems for partial differential equations, known as inverse problems in the mathematical-physics literature. By introducing stochastic processes to model errors in observation as well as disturbance one can provide a precise formulation to interpret what appear to be ad hoc techniques, especially in the treatment of inverse problems. More importantly, one can model unknown sources as stochastic disturbances leading to more general inverse problems than considered hitherto. The report deals only with Cauchy problems for partial differential equations with continuous time observation (as opposed to discrete time). Topics discussed include the following: The white noise process; A class of inverse problems; Stochastic formulation; Stochastic formulation continued: source noise. GRA

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N75-20052 Polish Academy of Sciences, Warsaw.
LINEAR DIFFERENTIAL EQUATIONS OF STATISTICAL KINEMATICS FOR SOLID BODIES [LINIOWE ROWNANIA ROZNICZKOWE KINEMATYKI STATYSTYCZNEJ DLA CIAL STALYCH]
Andrzej Sobaszek 1974 48 p refs In POLISH
(Rept-40/1974) Avail: Issuing Activity

A solution for a corrected transport equation is discussed, along with its relation to the kinetic theory of materials and discontinuous structures. General differential equations of self diffusion are derived for solid bodies at an extreme point in the area of differential equations (of statistical kinematics), and at a central point of length in the same area. The solutions for Einstein-Fokker and Ficks equations are compared with the solutions obtained in this investigation. Transl. by M.J.S.

N75-20053# Lockheed Missiles and Space Co., Palo Alto, Calif.
METHODS OF DIMINISHING CHECKING ERRORS
E. V. Volkov, R. S. Sudakov, and T. A. Syritsyn 1974 8 p Transl. into ENGLISH from the book "Osnovy Teorii Nadezhnosti Raketnykh Dvigatelei" Moscow, Mashinostroenie, 1974 p 307-316
Avail: NTIS HC $3.25; National Translations Center, John Crerar Library, Chicago, Ill. 60616

It was shown that the checking accuracy is determined by the accuracy of measuring the parameters, the fast-response, and the reliability of the checking system. Three signals were investigated at the checking system output as the result of interaction of the mentioned factors: a signal characterizing the normal operation of the object, a false signal when the system erroneously recognizes the emergency state of the object for an actual operative state, and a zero signal for an emergency state of the object when the system does not detect the emergency state. The probability of the appearance of the signals is determined by the block diagram of the checking system. Other topics discussed include accident prevention systems, sensors, and test stands. Author

N75-20054# Materials Research Labs., Maribyrnong (Australia).
FRAGMENTATION DATA ANALYSIS. 1. COMPUTER PROGRAM FOR MASS AND NUMBER DISTRIBUTIONS AND EFFECTS OF ERRORS ON MASS DISTRIBUTIONS
P. Krauklis and A. J. Bedford Nov. 1974 48 p refs
(MRL-549) Avail: NTIS HC $3.75

A computer program is presented which accepts data from a fragmentation test and calculates all the values necessary to plot seven fragment mass and number distribution graphs based on the conventional Mott and Payman Laws. Errors which can be introduced during the fragmentation experiment are considered in some detail by analyzing their possible effects on the fragment mass distributions based on the Payman Law. Trends corresponding to particular error types are characterized and it is

concluded that an allowance can be made for errors in many instances. An important finding is that a Payman distribution based on the original cylinder mass is least affected by the errors considered and is thus the method recommended for data analysis. Author

N75-20055# Los Alamos Scientific Lab., N.Mex.
SECOND MONTE CARLO SAMPLER
C. J. Everett and E. D. Cashwell Aug. 1974 58 p refs
(Contract W-7405-eng-36)
(LA-5723-MS) Avail: NTIS HC $4.25

Methods are suggested for sampling many additional probability densities occurring in practice, as well as more general forms of some of those appearing in the first SAMPLER. Notably, the frequent restriction to half-integer exponents was removed. As before, no claim to priority is intended, the sole object being to provide a handbook for Monte Carlo practice. Author (NSA)

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N75-20056 Polish Academy of Sciences, Warsaw.
MODELING A TECHNICAL SYSTEM AS AN OPTIMALIZATION PROCESS [MODELOWANIE SYSTEMU TECHNICZNEGO JAKO PROCES OPTYMALIZACYJNY]
Jerzy Wicher 1974 15 p refs In POLISH
(Rept-39/1974) Avail: Issuing Activity

A mathematical model is dicussed which can describe a certain group of properties or the relation existing between these groups by using an approximation method. This was found to lead to a reduction of the description of a great quantity of physical phenomena appearing in a real system, such as the processes of friction, wear and fatigue. A compromise model is described which eliminates those features and elements which are unessential for the investigation. Other topics discussed include a priori information, energy conversion, dynamic processes, algorithms, and parameter identification. Transl. by M.J.S.

N75-20057# Navy Personnel Research and Development Center, San Diego, Calif.
THE THEORY AND APPLICATION OF LINEAR DECISION PROGRAMMING Interim Report
Gordon B. Hatfield Nov. 1974 43 p refs
(AD-A002455; NPRDC-TR-75-4) Avail: NTIS CSCL 12/2

An investigation of mathematical forms that generalize the ordinary linear programming problem has led to the identification of a problem termed the decision programming canonical form. The study of this canonical form indicates the possibility of unifying certain theories and methods of decisionmaking, i.e., (1) linear programming, (2) vector maximization, (3) goal programming, (4) two person zero-sum games, (5) the Chebyshev approximation problem, and (6) satisficing. It is shown that solving a certain linear decision programming problem is equivalent to solving a linear vector minimization problem for an efficient point. Also, it is shown that a two-person, zero-sum game is equivalent to a linear decision programming problem where the payoff matrix is the set of goals. A general algorithm, called the minimum distance method, is developed for a class of decision programming problems. GRA

N75-19152* Calspan Corp., Buffalo, N.Y.
A SIMPLIFIED SIGNAL ANALYSIS TECHNIQUE FOR OBTAINING OPTIMAL ESTIMATES OF SYSTEM DYNAMICS
R. F. Whitbeck *In* MIT Proc. of the 9th Ann. Conf. on Manual Control 1973 p 319-323 refs (For availability see N75-19126 11-01)
CSCL 12B

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

No abstracts in this category.

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N75-20058 Purdue Univ., Lafayette, Ind.
ELECTROMECHANICALLY COUPLED VIBRATIONS AND SURFACE WAVES IN PIEZOELECTRIC MEDIA WITH OVERLAYS Ph.D. Thesis
Nai-Chung Cheng 1974 178 p
Avail: Univ. Microfilms Order No. 74-26695

This work concerns, in general, wave propagation and vibration in layered piezoelectric media. First, harmonic wave propagations in two-layered piezoelectric plates are investigated by exact three-dimensional theory of piezoelectricity and by approximate methods. Two approximate plate theories are presented. Comparison between the exact and the approximate solutions is made for wave propagation in plates of hexagonal crystals, CdS and ZnO. Good agreement is found for the first approximate theory with the exact solution within the whole frequency range of practical interest, while the second approximate solution is good only for the lowest mode. Thickness vibrations are also studied by the exact and the approximate theories. Rayleigh surface wave propagation in layered piezoelectric half-space was also studied. Dissert. Abstr.

N75-20059 Johns Hopkins Univ., Baltimore, Md.
THE GOETTINGEN RECEPTION OF EINSTEIN'S GENERAL THEORY OF RELATIVITY Ph.D. Thesis
Lewis Robert Pyenson 1974 436 p
Avail: Univ. Microfilms Order No. 74-27925

After an introduction discussing Einstein's development of the general theory of relativity, and summarizing other theories of gravitation in the period 1880-1910, some results are given of a systematic survey of all articles published on general relativity between 1912 and 1919. A center at Goettingen during the period 1902 to 1909 is considered in detail. The three interconnected traditions which formed the Goettingen reception of general relativity (mathematical physics, electrodynamics and the electron theory, and cosmic physics) are discussed in detail along with the scientists who followed each tradition. Dissert. Abstr.

N75-20060# National Center for Atmospheric Research, Boulder, Colo. Facilities Lab. and High Altitude Observatory.
FORCE-FREE MAGNETIC FIELD COMPUTATION 1
R. E. Wellck and Y. Nakagawa Aug. 1973 45 p refs Sponsored by NSF
(NCAR-TN/STR-87) Avail: NTIS HC $3.75

The physical background and the basic equations of a general force-free magnetic field are described, and it is shown that for a class of constant alpha force-free magnetic fields a unique determination of the magnetic field is possible on the basis of magnetogram observations. The details of the numerical method of this determination are described. The formulations described also serve to specify the initial conditions for the evolutionary study of a more general force-free magnetic field, in which alpha is a function of space and time. Author

N75-20061# Tokyo Univ. (Japan). Inst. of Space and Aeronautical Science.
ANOMALOUS RESISTIVITY IN A MAGNETIC NEUTRAL POINT
Nobuyoshi Ohyabu and Nobuki Kawashima 1974 11 p refs Repr. from Inst. of Space and Aeron. Sci., Univ. of Tokyo, Report (Japan) no. 512, May 1974 p 173-179
(ISAS-512-Vol-39-No-9) Avail: NTIS HC $3.25

Anomalous resistivity is observed in a collision-free magnetic neutral point discharge. It appears as a sharp rise (hump) of the voltage between discharge electrodes. Its height increases as (1) the plasma density is decreased, (2) the discharge voltage is increased, and (3) the external quadrupole magnetic field is increased. The electron temperature was measured from the absorption method of X-ray. At the time of the appearance of this hump, the electron rises abruptly up to 10 KeV which means that the magnetic energy supplied from the electric energy in the capacity is dissipated and converted into the thermal energy of the plasma. Author

N75-20062# Grimes (W. J.) and Co., Silver Spring, Md.
TWO EXAMPLES OF THE COLLAPSE OF LANGMUIRIAN WAVES
L. M. Degtyarev, V. E. Zakharov, and L. I. Rudakov Oct. 1974 18 p refs Transl. into ENGLISH from Russian Preprint-35 Sponsored by ERDA
(AEC-TR-7585; Preprint-35) Avail: NTIS HC $3.25

Two examples of the collapse of Langmuirian waves are presented -- a highly nonlinear process of concentration of oscillations in regions of reduced plasma density. The first example considers on a numerical and analytical basis the collapse of a unidimensional spherical soliton toward the center, while the second considers the nonlinear stage of instability in the two-dimensional case of a plane soliton. Author (NSA)

N75-20063# Los Alamos Scientific Lab., N.Mex.
MULTIPLE TIME SCALE PERTURBATION FOR TWO FREQUENCY NONLINEAR TAYLOR INSTABILITY
G. N. White Aug. 1974 8 p refs
(Contract W-7405-eng-36)
(LA-5717-MS) Avail: NTIS HC $3.25

The nonlinear interaction of two Taylor unstable waves of different initial amplitude and frequency is studied by means of a multiple time scale perturbation. Unlike the single time scale expansion, the multiple scale treatment shows, explicitly, a dependence of the growth rate on the initial amplitudes and frequencies and confirms the early growth rate dependency found in numerical calculations. Author (NSA)

N75-20202 Joint Publications Research Service, Arlington, Va.
IMPORTANCE OF THEORETICAL PHYSICS FOR NATURAL SCIENCES
Klaus Fuchs *In its* Transl. on Eastern Europe: Sci. Affairs, No. 455 (JPRS-64146) 21 Feb. 1975 p 4-10 Transl. into ENGLISH from Spektrum (East Ger.), Nov. 1974 p 12-15 (For availability see N75-20201 11-99)

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution.*

N75-20064 Polish Academy of Sciences, Warsaw.
ACOUSTICS OF A THREE-PHASE, SINGLE-COMPONENT MIXTURE FOR SMALL KNUDSEN NUMBERS [AKUSTYKA MIESZANINY TROJFAZOWEJ JEDNOSKLADNIKOWEJ DLA MALYCH LICZB KNUDSENA]
Jozef Lewandowski 1974 25 p refs In POLISH
(Rept-38/1974) Avail: Issuing Activity

The flow of multiphase multiconstituent and single-constituent mixtures was discussed along with the propagation of small (in comparison with the equilibrium values) disturbances in the thermodynamic parameters. Other topics discussed include damping (attenuation) coefficients, phase velocity, acoustic equations, gas phases, inviscid fluid, Knudsen flow, and flow equations. Transl. by M.J.S.

N75-20065 Johns Hopkins Univ., Baltimore, Md.
MODULATION OF ACOUSTIC WAVE BY TURBULENT SHEAR FLOW Ph.D. Thesis
Chih-ming Ho 1974 202 p
Avail: Univ. Microfilms Order No. 74-27915

The collimated Monochromatic and coherent acoustic wave, (a sine wave of 3 KHz-90 KHz), was directed perpendicularly across a two-dimensional turbulent jet. Extensive study of the statistical properties of both the turbulent flow and of the received wave (amplitude and phase modulation) offers physical insight into the general phenomenon of a periodic pressure field scattered by a random solenoidal velocity field. In addition, there is strong indication that the acoustic wave may be used as a diagnostic tool for measuring some statistical properties of the turbulence velocity field. Dissert. Abstr.

N75-20066*# General Electric Co., Schenectady, N.Y. Research and Development.
RADIATION OF CYLINDRICAL DUCT ACOUSTIC MODES WITH FLOW MISMATCH
S. D. Savkar and I. H. Edelfelt Mar. 1975 59 p refs
(Contract NAS1-11984)
(NASA-CR-132613; SRD-75-029) Avail: NTIS HC $4.25 CSCL 20A

Calculations for the radiation of spinning acoustic modes, with or without a centerbody, and with or without flow temperature and velocity discontinuity, are presented. Solutions to the appropriate convected wave equations devised around Fourier transforms and Wiener-Hopf technique are presented. The decomposition of the asymmetric kernel, resulting from a flow and temperature mismatch, is carried out in part exactly and partially using the so-called Carrier-Koiter approximation procedure. The resulting solutions offer a good approximation to the radiation of both symmetric and asymmetric modes through a flow discontinuity represented as a plug flow jet issuing from a cylindrical duct. Besides the Koiter approximation, the major limitation on the calculation program is the difficulty of calculating the high order Bessel functions with sufficient accuracy. Author

N75-20067# Dow Chemical Co., Golden, Colo. Rocky Flats Div.
ACOUSTIC EMISSION: A BIBLIOGRAPHY FOR 1970-1971-1972
T. F. Drouillard 15 Mar. 1974 128 p refs Revised
(Contract AT(29-1)-1106)
(RFP-2059-Rev) Avail: NTIS HC $5.75

The bibliography includes almost all references in the literature on acoustic emission published during the three-year period, 1970 through 1972. Included in the 412 references are several for each of the associated technologies including signature analysis, boiling detection, cavitation, leak detection, seismology, and rock mechanics. Information was obtained from eight abstracting and indexing services in compiling the bibliography. The bibliography is arranged alphabetically by author and is cross-referenced with a list of approximately 400 authors. Also included is a subject index. Author (NSA)

N75-20068# Naval Undersea Center, San Diego, Calif.
HOLOGRAPHIC ACOUSTIC IMAGING Research and Development Report, Feb. 1971 - Apr. 1974
N. O. Booth and J. L. Sutton Aug. 1974 21 p refs
(AD-A002257; NUC-TP-424) Avail: NTIS CSCL 20/1

An overview of acoustic imaging methods is presented highlighting the similarities and differences between focused, beamformed, and holographic systems. A holographic acoustic imaging system designed for medium range viewing in the deep ocean is described. Several technological improvements for future holographic systems are suggested and discussed. GRA

N75-20069# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
SHOCK TUBE MEASUREMENT OF THE WEAK SHOCK REFLECTION CHARACTERISTICS OF ACOUSTIC MATERIALS Final Report, Aug. - Dec. 1971
Richard B. Rivir, Donald P. McErlean, and Douglas C. Rabe Aug. 1974 72 p refs
(AF Proj. 317J)
(AD-A002133; AFAPL-TR-74-28) Avail: NTIS CSCL 20/7

Weak shock wave interactions with absorber materials normal to the wave were studied. The experiments included the use of a 2.06-inch shock tube to generate waves where the shock pressure ratios ranged from 1.2 to 2.0. The effect of incident pressure ratio, thickness of material, diameter of perforation, closed area, and flow resistance were studied. The results indicated

that percent closed area, flow resistance, and pressure ratio were the most significant parameters in determining the reflection coefficient. A conventional steady-state flow measurement of the flow resistance could be used to predict the reflection coefficient when the flow resistance was measured at the appropriate velocity. GRA

N75-20070# Southwest Research Inst., San Antonio, Tex.
SEISMIC AND ACOUSTIC TARGET LOCATING DEVICES (TLD-4 AND TLD-5) Final Technical Report, 19 Dec. 1973-1 Oct. 1974
Sidney A. Suhler, Thomas E. Owen, Jackie E. Hipp, Wendell R. Peters, Oren Tranbarger, and Hugh F. Spence 1 Oct. 1974 98 p
(Contract DAAK02-74-C-0099; DA Proj. 1X7-63719-DK-73)
(AD-A002061) Avail: NTIS CSCL 17/1

The report describes a development program under Project REMBASS. Technical requirements were for field deployable sensor devices capable of detecting and reporting the presence of military vehicles within specified detection ranges. In addition, alarms were required indicating two relative range positions and time instant of closest approach to the sensor of the target vehicles. Two systems were developed, one sensing airborne acoustic emanations, the other earth borne seismic vibrations. The report provides a description of the signal analysis investigation leading to the final concepts and also gives details of the concept implementation and test results. GRA

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N75-20071 Stanford Univ., Calif.
HIGH RESOLUTION QUANTUM BEAT SPECTROSCOPY USING PULSED TUNABLE DYE LASERS Ph.D. Thesis
Jeffrey Alan Paisner 1974 155 p
Avail: Univ. Microfilms Order No. 74-27076

An examination was made of the quantum interference effect which occurs when an atom or molecule is prepared by a short, resonant light pulse in a superposition of excited states having slightly different energies. The fluorescent light re-emitted by the system after the optical excitation exhibits modulations at frequencies corresponding to the energy splittings between the decaying excited states. As a result, the study of these modulations, called optical quantum beats, can provide an innovative tool for precisely measuring small structure splittings in atoms and molecules. Using a narrowband tunable pulsed dye laser, two quantum beat experiments were performed. In atomic cesium beats arising from coherent excitation of hyperfine levels in 7 2P 2/3 state were detected. In addition, weak field Zeeman quantum beats in the fluorescent emission from individual rotational levels of the B3 pi (+) sub ou were observed. Dissert. Abstr.

N75-20072 Columbia Univ., New York.
INTERNAL STATE DISTRIBUTION AND ALIGNMENT OF ALKALI DIMERS IN SUPERSONIC NOZZLE BEAMS Ph.D. Thesis
Mahadeva Prasad Sinha 1974 150 p
Avail: Univ. Microfilms Order No. 74-28532

A technique is described, involving fluorescence for the characterization of the internal states of molecules in nozzle beams. The population distribution of the (v,J) levels of the ground state was measured, using spectroscopic analysis of white light and laser-induced fluorescence. It is shown that coefficients of the first three even-ordered legendre polynomials in the spatial distribution expansion are determined from measuring the degree of polarization of molecular fluorescence. Dissert. Abstr.

N75-20073# Kozponti Fizikai Kutato Intezet, Budapest (Hungary).
MULTIPHOTON ELECTRON EMISSION PROCESS INDUCED BY DIFFERENT KINDS OF ULTRASHORT LASER PULSES
G. Farkas and Z. G. Horvath 1974 15 p refs
(KFKI-74-64) Avail: ERDA Depository Libraries HC $4.00

Using ultrashort laser pulses of regular (Gauss-shaped) time and spectral distribution, theoretically predicted multiphoton electron emission processes were observed. On changing this regular form of the ultrashort light pulses, however, the character of the emission process also changes, the explanation of which follows only partly from the evolution of the mode-locking train. Author (NSA)

N75-20074# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Chemistry.
INFRARED PROPERTIES OF SOLIDS UNDER HIGH PRESSURE: CHLORINATED BENZENES AND INORGANIC CARBONATES
R. F. Glienna Sep. 1974 50 p refs
(Contract W-7405-eng-48)
(LBL-3169) Avail: NTIS HC $3.75

An investigation was made of the infrared spectra of 1,2,4,5-tetrachloro benzene, 1,4-dichloro benzene, and four naturally occurring carbonate minerals at pressures of up to 35 kilobars. Intermolecular effects manifest in the vibrational spectra are explained within the context of vibrational coupling through transition dipoles. One and two dimensional models to simulate real crystals are used. Results of dipole-dipole interaction calculations are compared with the experimental data. The possibility of calculating bulk properties of materials through the use of their infrared spectra is discussed. Author (NSA)

N75-20075# Oak Ridge National Lab., Tenn.
TRANSURANIUM PROCESSING PLANT: PRODUCTION, STATUS, AND PLANS Semiannual Report, period ending 31 Dec. 1973
L. J. King, J. E. Bigelow, and E. D. Collins Nov. 1974 28 p refs
(Contract W-7405-eng-26)
(ORNL-4965) Avail: NTIS HC $3.75

The status and production plans of the transuranium element production program are discussed. During the period July 1, 1973, through December 31, 1973, transuranium elements were recovered from 10 irradiated HFIR targets. In addition, 77 g of cm-244 (81 g of curium) for the heat source program were repurified, and transuranium elements were recovered from accumulated rework materials. Product finishing operations are discussed along with maintenance operations, neutron sources, and other special projects conducted. The current values used for transuranium element decay data and for cross-section data in planning irradiation-processing cycles, calculating production forecasts, and assaying products are tabulated. Author (NSA)

N75-20076# California Univ., La Jolla. Dept. of Chemistry.
DOUBLE ABSORPTION PHOTOFRAGMENT SPECTROSCOPY: A NEW TOOL FOR PROBING UNIMOLECULAR PROCESS
R. K. Sander and R. K. Wilson Oct. 1974 54 p refs
(Contract N00014-69-A-0200-6020)
(AD-A002228) Avail: NTIS CSCL 07/5

A new technique, Double Absorption Photofragment Spectroscopy (DAPS), has been developed for observing the time evolution of unimolecular processes. Molecules isolated from collisions in a molecular beam are prepared in a well defined intermediate state by an initiation laser pulse. As this state evolves in time, it is monitored by a second probe laser pulse which, after a chosen delay, photodissociates the molecules. Information about the state to which the molecules have evolved by the time of the probe pulse can be extracted from the mass, density, angular and energy distributions of the recoiling fragments. Simple models are explored for the functional form of the angular distributions which can be expected in DAPS experiments. Future DAPS experiments should be able to observe unimolecular electronic and nuclear change over a time span from 10 to the -12th power to 10 to the -3rd power seconds, probing such processes as rearrangement, dissociation, internal vibrational transfer, intersystem crossing and internal conversion. GRA

N75-20077# Bowling Green State Univ., Ohio. Dept. of Physics.
TRANSFER OF THERMAL ENERGY TO SELECTED VIBRATIONAL BANDS IN THE INFRARED Final Report, 22 Apr. - 30 Sep. 1974

Edgar B. Singleton Sep. 1974 25 p
(Contract DAAE07-74-C-0153; DA Proj. 1G7-63726-D-471)
(AD-A001699; TACOM-TR-11990) Avail: NTIS CSCL 07/4

Molecular gases are considered as possible additives to the exhaust stream of internal combustion engines with the purpose of transferring thermal energy of the exhaust gases to vibrational energy of the additives in order to reduce the temperature of the exhaust gases and the manifold system. The gases considered are carbon dioxide bromotrifluoromethane, vapor from ethylene glycol coolant solutions, and in some cases air and nitrogen. These gases are introduced into the exhaust stream of a hydrocarbon burner specially constructed for use in the laboratory. Emission spectra in the infrared region from 2 to 16 micrometers are presented for the heated exhaust gases and parts of the exhaust port. CBrF3 is the only additive, of those presented, which produces a sufficient effect within the criteria established to warrent further study. GRA

N75-20078# Science Applications, Inc., Palo Alto, Calif.
NONEQUILIBRIUM CONDUCTIVITY OF AIR INDUCED BY IONIZING RADIATION Final Report
Robert R. Johnston 30 Nov. 1974 36 p refs
(Contract N00014-74-C-0360; NR Proj. 020-027)
(AD-A001765; SAI-072-626-PA) Avail: NTIS CSCL 07/5

The report summarizes computer results for the time-dependent non-equilibrium conductivity of air subjected to an intense dose of ionizing radiation in the presence of a strong electric field. A two-temperature model is employed throughout, and an appropriate set of reaction equations for the time-dependent specie concentrations are solved. Results are presented for the conductivity, the electron concentration, and the electron and gas temperatures for several cases of interest. GRA

N75-20079# Pittsburgh Univ., Pa. Atomic Sciences Inst.
ATOMIC AND MOLECULAR PROCESSES Progress Summary Report
M. A. Bioni 30 Oct. 1974 23 p refs
(Contract N00014-67-A-0402-0010; ARPA Order 2686)
(AD-A001811; PSR-17) Avail: NTIS CSCL 07/4

The report includes summaries of research in the areas of laser studies, atmospheric radiation backgrounds, and infrared early warning. GRA

N75-20080# Indiana Univ., Bloomington. Dept. of Physics.
RELATIVE TRANSITION PROBABILITIES IN DE-EXCITATION OF ATOMIC STATES BY COLLISIONAL QUENCHING Interim Report
F. A. Franz, R. Boggy, and C. E. Sooriamoorthi 1974 5 p refs
(Grant AF-AFOSR-2652-74; AF Proj. 9767)
(AD-A001916; AFOSR-74-1815TR) Avail: NTIS CSCL 07/4

Relative probabilities were measured for quenching induced transitions between the Zeeman sublevels of the doublet P(1/2) and doublet S(1/2) states of cesium. GRA

N75-20081# Naval Research Lab., Washington, D.C.
PREDISSOCIATION OF THE SCHUMANN-RUNGE BANDS OF O2
Paul S. Julienne and M. Krauss Oct. 1974 27 p refs Prepared in cooperation with NBS, Washington, D. C.
(DNA Proj. NWED-QAXH-C062)
(AD-A002438; NRL-MR-2900) Avail: NTIS CSCL 07/4

The predissociation line broadening in the Schumann-Runge bands of O2 is explained by an ab initio calculation of the pertinent repulsive potential energy curves and spin-orbit matrix elements. The ab initio results provide an overall qualitative picture of the predissociation which is further refined through a detailed comparison with experiments. The dominant repulsive curve is also deduced by a deperturbation of the level shift in the second vibrational difference. The predissociation is dominated by the quintet PiU-state crossing the B triplet signa U-state around 1.87 A with a spin-orbit matrix element of 65/cm. The apparent experimental widths between v=5 and 11 are shown to be inconsistent with the theoretical analysis, the difference probably being due to line blending. Author (GRA)

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

N75-20082*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ANGULAR DISTRIBUTION, KINETIC ENERGY DISTRIBUTIONS, AND EXCITATION FUNCTIONS OF FAST METASTABLE OXYGEN FRAGMENTS FOLLOWING ELECTRON IMPACT OF CO2
M. Misakian (Maryland Univ., College Park), M. J. Mumma, and J. F. Faris Mar. 1975 55 p refs
(NASA-TM-X-70859; X-690-75-55) Avail: NTIS HC $4.25 CSCL 20H

Dissociative excitation of CO2 by electron impact was studied using the methods of translational spectroscopy and angular distribution analysis. Earlier time of flight studies revealed two overlapping spectra, the slower of which was attributed to metastable CO(a3 pi) fragments. The fast peak is the focus of this study. Threshold energy, angular distribution, and improve time of flight measurements indicate that the fast peak actually consists of five overlapping features. The slowest of the five features is found to consist of metastable O(5S) produced by predissociation of a sigma u + state of CO2 into O(5S) + CO(a3 pi). Oxygen Rydberg fragments originating directly from a different sigma u + state are believed to make up the next fastest feature. Mechanisms for producing the three remaining features are discussed. Author

N75-20083# United Kingdom Atomic Energy Authority, Springfields (England). Reactor Group.
EPIMETHEUS (HELLFIRE 1): AN X-RAY DIFFRACTION DATA VALIDATION PROGRAM
M. A. Eastham, I. F. Ferguson, and T. E. Hughes Aug. 1974 74 p refs
(TRG-2502(S)) Avail: ERDA Depository Libraries HC $4.25; UK £1.50

The FORTRAN program EPIMETHEUS is described. The program orders, validates, and checks data output as punched cards from PROMETHEUS, RFL's automatic X-ray diffractometer. The validated data are placed in a named file on disc for subsequent use by other programs in the HELLFIRE suite of FORTRAN X-ray powder diffraction data processing programs.
Author (NSA)

N75-20084# Sandia Labs., Albuquerque, N.Mex.
COMPUTER SIMULATION OF FOCUSED ION BEAMS
J. E. Boers, J. R. Freeman, and J. W. Poukey 1974 9 p refs Presented at Symp. on Ion Sources and Formation of Ion Beams, Berkeley, Calif., 22 Oct. 1974 Sponsored by ERDA
(SLA-74-5332; Conf-741019-1) Avail: NTIS HC $3.25

Two digital computer programs were employed in the simulation of plasma expansion cups and the ion beams drawn from them. The axially symmetric ion beam is simulated with a relativistic beam program assuming that a particular plasma surface exists on the plasma expansion cup. Electrodes are employed which produce a focused ion beam at the voltage and current desired assuming space-charge-limited emission from the plasma surface. Then, boundary conditions are taken from the beam simulation near the plasma surface and used as input data for the plasma simulation program. The shape of the cup and the plasma injection rate can then be varied until the proper ion current is obtained from a surface close to that assumed in the beam program. Using this technique, deuteron beams of more than one ampere of current and source current densities in excess of 10,000 A/sqm were simulated. Author (NSA)

N75-20085# Oak Ridge National Lab., Tenn.
HIGH INTENSITY ION SOURCE FOR THERMONUCLEAR RESEARCH AND DEVELOPMENT
O. B. Morgan 1974 26 p refs Presented at the Symp. on Ion Sources and Formation of Ion Beams, Berkeley, Calif., 22-25 Oct. 1974 Sponsored by ERDA
(Conf-741019-4) Avail: NTIS HC $3.75

A discussion is given of recent ion source developments in the U.S. that have resulted in the availability of 10's of amperes of hydrogen ion beams at energies of 10's of keV and with total energies up to 10's of kJ that can be utilized for creating hot, confined plasmas in magnetic devices. The present status of this thermonuclear development program is discussed along with some of the future plans and possible alternatives for accomplishing some very challenging goals. NSA

N75-20086# Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Lab.
Pu-238 FUEL FORM PROCESSES Monthly Report
Oct. 1974 18 p refs
(Contract AT(07-2)-1)
(DPST-74-128-10) Avail: NTIS HC $3.25

Twelve hundred g of CeO2 shards for simulant testing of the PuFF hot press was produced. Techniques used at Mound Laboratory for welding PISA's are reviewed. Unsintered fines can be recycled directly to the cold pressing step in the production of shards for the heat source for the milliwatt thermoelectric generator. Author (NSA)

N75-20087# Sandia Labs., Albuquerque, N.Mex.
PRELIMINARY SYSTEMS CONSIDERATIONS FOR AN ELECTRON-BEAM-INDUCED FUSION POWER PLANT
S. G. Varnado, V. L. Dugan, R. D. Klett, R. H. Richards, and S. G. Vandevender Oct. 1974 46 p refs
(Contract AT(29-1)-789)
(SAND-74-0160) Avail: NTIS HC $3.75

A brief overview of systems considerations for a relativistic-electron-beam-initiated fusion power plant is presented. A conceptual configuration for the plant is described. Subsystem efficiencies are estimated and used in computing required pulse repetition rates, fuel requirements, and overall system efficiency. The effect of a hybrid (fusion-fission) blanket on overall system performance is assessed. A comparison between laser fusion reactors and E-beam fusion reactors is presented using circulating power fraction as a figure-of-merit. Suggestions for future work are given. Author (NSA)

74 OPTICS

Includes light phenomena.

N75-20088 Carnegie-Mellon Univ., Pittsburgh, Pa.
THE USE OF NONLINEAR ABSORBERS IN COHERENT OPTICAL DATA PROCESSING Ph.D. Thesis
Kenneth T. Stalker 1974 215 p
Avail: Univ. Microfilms Order No. 74-26635

The expansion of optical processing has brought with it the need for real-time processing capability. Through the use of nonlinear processing techniques, an innovative processing scheme is developed which uses the nonlinear transmittance of a saturable absorber to mix the Fourier spectra of two input functions producing correlation and convolution operations in real-time. Using this system, only the input functions need to be changed for each processing operation, thus eliminating the often difficult and time consuming spatial filter preparation step necessary in other proposed real-time systems. Dissert. Abstr.

N75-20089 Cincinnati Univ., Ohio.
OPTICAL ABSORPTION IN SIMPLE METALS Ph.D. Thesis
Martin William Ribarsky 1974 139 p
Avail: Univ. Microfilms Order No. 74-26394

A wave field formalism is developed which applies the orthogonalized plane wave method to the many-body problem in order to describe the optical absorption in simple metals. The theory developed incorporates separate features of the absorption process pointed out by different authors and specifically includes the effects of electron-electron interactions. Calculations are presented for the interband absorption in Na and K for optical energies from the threshold to above the plasma energy, and comparisons are made with calculations in the independent particle model and with recent experimental results.
Dissert. Abstr.

N75-20090+ Centre de Recherches et de Calculs Optiques, Courbevoie (France).
DEVELOPMENT AND PERFECTION OF A SCALE MODEL OF AN OPTICAL DEVICE WITH UNIT MAGNIFICATION, CONTACTLESS REPRODUCTION OF MASKS Final Report [MISE AU POINT ET REALISATION DE LA MAQUETTE D'UN SYSTEME OPTIQUE AU GRANDISSEMENT 1, REPRODUCTION DE MASQUES SANS CONTACT]
M. LeLuyer Dec. 1973 29 p In FRENCH
(Contract DGRST-71-7-2737)
Avail: NTIS HC $3.75

An optical device with unit magnification for contactless reproduction of masks used in integrated circuit fabrication is presented. The objective lens is described with regard to illuminance problems arising from the quarter wave plate, the Lummer cube, and the dichroic mirror. The mounting and centering of the correcting elements are described. A 2/3 scale model was built and tested with regard to astigmatism. The quality control tests are also discussed. ESRO

N75-20091*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
STACK PLUME VISUALIZATION SYSTEM Patent Application
Reginald J. Exton, inventor (to NASA) Filed 11 Mar. 1975 11 p
(NASA-Case-LAR-11675-1; US-Patent-Appl-SN-557448) Avail: NTIS HC $3.25 CSCL 20F

A method and apparatus for measuring, at a remote location, the concentration and velocity of SO2 in plume from a smokestack is disclosed. An ultraviolet video system views the plume against the background sky at wavelengths where SO2 molecules absorb light. The result is a real time display of the plume coupled with means for measuring the SO2 concentration at any point in the plume and at any time desired. In addition, means are provided in combination with the ultraviolet video system for measuring the velocity of the SO2 in the plume. NASA

N75-20092# Konkoly Observatory, Budapest (Hungary).
THREE COLOR PHOTOMETRY OF WCVn, LIGHT CURVE AND PERIOD
J. Tremko (Astronomical Inst. of the Slovak Acad. of Sci., Skalnate Pleso, Czech.) 1974 16 p refs
(Rept-67) Avail: NTIS HC $3.25

Three color photoelectric observations of the variable star W CVn obtained at Konkoly Observatory and at Skalnate Pleso Observatory were interpreted. The investigation shows secular change of the period and a stable light curve. The interstellar absorption in the direction of the variable is discussed and the absolute magnitude from the period - luminosity relation is derived. A color-color diagram was constructed and the distance of 980 pc for the variable was determined. Author

N75-20093# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
FUNDAMENTAL LIMITATIONS ON IMAGE RESTORATION Interim Report, 6 May - 6 Sep. 1974
Richard G. Barakat and Elliot S. Blackman Oct. 1974 54 p refs
(Contract F30602-74-C-0176)
(AD-A001574; RADC-TR-74-277) Avail: NTIS CSCL 20/6

The objective of this program is the analysis of the fundamental limitations placed upon image restoration by the presence of noise and unavoidable atmospheric and optical system degradations. The approach is to treat individually and in concert the several factors which limit image formation (direct problem) and further limit image restoration (inverse problem), to understand their interrelation and order of importance. GRA

N75-20094# Naval Training Equipment Center, Orlando, Fla.
EVALUATION OF A DUAL AXIS HOLOGRAPHIC LENS Technical Note, Feb. - Aug. 1974
Neil Mohon Sep. 1974 45 p ref Presented at the Natl. Meeting of the Optical Soc. of Am., Houston, Texas, 15-18 Oct. 1974
(AD-A002253; NAVTRAEQUIPC-TN-41) Avail: NTIS CSCL 20/6

A two-axis single holographic lens element is evaluated as to its quality in the areas of: diffraction efficiency, resolving

power, Hartmann graphs, spherical aberration, coma, astigmatism, field curvature, distortion, chromatic aberration, and angle of diffracted light. The holographic element is shown to be satisfactory for a virtual image display in all areas except chromatic aberration. GRA

N75-20095# Naval Research Lab., Washington, D.C.
RADIATION EFFECTS IN FIBER OPTIC WAVEGUIDES Final Report
G. H. Sigel, Jr., B. D. Evans, R. J. Ginther, E. J. Friebele, and D. L. Griscom Nov. 1974 93 p refs
(RR0220601)
(AD-A001703; NRL-MR-2934) Avail: NTIS CSCL 20/6

A comprehensive review is presented on the effects of ionizing radiation on the performance of fiber optic cables, and on the materials used for fabrication of optical fibers. This includes a summary of the permanent and transient radiation-induced losses in optical transmission of state of the art fibers, a detailed discussion of the mechanisms responsible for the losses observed, and a report on inhouse materials development to achieve radiation hardened fiber optic glasses. GRA

N75-20096# IBM Watson Research Center, Yorktown Heights, N.Y.
ELECTRO-OPTICS VS. MAGNETO-OPTICS: POWER CONSIDERATIONS Final Technical Report
A. R. Reisinger, C. G. Powell, and S. C. Tseng Nov. 1974 65 p refs
(Contract N00014-73-C-0256; ARPA Order 2327)
(AD-A002276) Avail: NTIS CSCL 20/6

Conventional calculations of the power per unit bandwidth, based on the evaluation of the energy stored in the active crystal, indicate that magneto-optic modulators might be more attractive than their electro-optic counterparts. However, these calculations do not take into account the dynamical response of an assembly of spins placed in a magnetic field. Whether magnetization reversal takes place by coherent rotation or domain wall motion, the switching time decreases with increasing modulating field amplitude. This behavior is expected on a theoretical basis and is well confirmed by experiments. As a corollary, the bandwidth of a m-o device can be pushed upwards only at the cost of increasing power consumption. With presently available films, the power requirements are such that magneto-optics does not appear to be competitive with electro-optics for the construction of wideband, low power, integrated optical modulators. GRA

N75-20097# Frankford Arsenal, Philadelphia, Pa.
A GAUSSIAN TOLERANCE TECHNIQUE FOR MULTILAYER OPTICAL COATINGS
John J. Walls, Jr., Richard A. McKyton, and Adolph Kawalec Oct. 1974 22 p refs
(DA Proj. 6737180)
(AD-A002596; FA-TR-74027) Avail: NTIS CSCL 20/6

Discussed is a computer program that mathematically simulates production manufacturing tolerances for multilayer optical coatings. This technique operates on an ideal theoretical multilayer design by assigning random Gaussian-like film thickness errors for each layer within the film stack. N iterations of this process are performed to obtain a realistic effect of the film thickness variations on the spectral reflection and transmission characteristics of the coating. Thus, this program enables the identification of those optical coating designs that have sensitive thickness requirements and also allows for the generation of practical thickness tolerances for the many optical coatings used in fire control instrumentation. GRA

N75-20098# Frankford Arsenal, Philadelphia, Pa.
CHARACTERIZATION OF OPTICAL GRADE GERMANIUM
Sheldon J. Cytron Mar. 1974 19 p refs
(AD-A002598; FA-M74-5-1) Avail: NTIS CSCL 20/6

Various techniques were used to characterize optical grade germanium as to its suitability for optical element fabrication. Major concern centered about various material defects causing gradients in the refractive index and the need to detect these defects in germanium prior to its processing into optical elements. Cursory tests employing such methods as IR transmittance, X-ray radiography, X-ray topography and resistivity mapping were made on several germanium blank discs obtained from primary raw material suppliers. The tests indicated that these methods gave somewhat limited results and by themselves provided only a circumscribed characterization of the material. A review of the literature on interferometry suggests that IR laser interferometry might be a promising quality assurance technique, although the extent of sample preparation for this technique may make its use too costly in any proposed quality inspection system. GRA

N75-20099# Frankford Arsenal, Philadelphia, Pa.
THIN FILM MATERIALS AND DEPOSITION TECHNIQUES FOR INFRA-RED COATINGS
Richard A. McKyton and John J. Walls, Jr. Oct. 1974 24 p
(DA Proj. 6737180)
(AD-A002597; FA-TR-74028) Avail: NTIS CSCL 20/6

This report describes the coating materials and deposition techniques used for producing film systems in the mid-IR spectral region (2.0 - 14.0 micrometers) on Ge windows. It discusses the selection of coating materials and establishes the optical and physical properties of a low middle and high index film material suitable for film systems designed for use at 10.6 micrometers. Four IR coating designs were fabricated and their spectral characteristics compared to a computer generated tolerance analysis of the theoretical designs. For this work the following low index materials and mixtures were investigated to determine which would be the optimal choice: Calcuum fluoride; Magnesium fluoride; Mixtures of CaF2,MgF2; Mixtures of CaF2, Al2O3; Glass, SiO2; Cryolite, Na3AlF6; and ZnS Tests for adhesion, abrasion and durability were made for each film. GRA

N75-20100# Naval Electronics Lab. Center, San Diego, Calif.
INTEGRATED OPTICAL CIRCUIT COMPONENTS Technical Report, 1 Oct. - 30 Dec. 1973
W. M. Caton 17 Sep. 1974 63 p ref
(ARPA Order 2158)
(AD-A002459; NELC-TR-1931) Avail: NTIS CSCL 20/6

The application of integrated optical circuits (IOC) and fiber optics to military programs in aircraft, shipboard, and other systems is discussed. The feasibility of employing fiber optics and IOC technology for such military applications as high-capacity (multi-GHz) telecommunication and secure (nonradiating and radiation resistant) communication systems was investigated. Other topics discussed include theoretical analysis of distribution networks, electrically controllable couplers for integrated optics, mode conversion in periodically disturbed thin film waveguides, electromagnetic theory of bounded DFB lasers, linear waveguide and horn-shaped coupling structures, and mechanical properties of glass fiber waveguides. Author (GRA)

N75-20101# Army Foreign Science and Technology Center, Charlottesville, Va.
AS IN DAYLIGHT
E. Kosyrev 14 Mar. 1974 11 p Transl. into ENGLISH from Voennye Znaniya (USSR) no. 3, 1973 p 40-41
(AD-A002720; FSTC-HT-23-1867-73) Avail: NTIS CSCL 19/5

The need for night vision devices in combat is discussed, and attention is directed at infrared devices, particularly the NAP 1 night weapon sight. Description and operation of the unit are included, as is a warning against detection by an enemy with similar equipment. GRA

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N75-20102# Atomic Energy Commission, Oak Ridge, Tenn. Technical Information Center.
CONTROLLED FUSION AND PLASMA RESEARCH: A LITERATURE SEARCH
M. O. Whitson Nov. 1974 422 p refs
(TID-3557-S3) Avail: NTIS HC $10.50

Approximately 3100 references to research reports and journal articles are cited, covering work on basic plasma physics, thermonuclear devices, magnetic fields, and other topics related

to controlled fusion research. A subject index is included.
Author (NSA)

N75-20103# Sandia Labs., Albuquerque, N.Mex.
LASER PLASMA STUDIES OF SOLID PELLETS IRRADIATED WITH THE SANDIA FOUR-BEAM LASER
J. E. Powell, E. H. Beckner, P. J. Brannon, G. L. Cano, J. F. Cuderman, K. M. Glibert, J. J. Hohlfelder, and E. D. Jones 1974 4 p Presented at 5th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Tokyo, 11 Nov. 1974 Sponsored by ERDA (SLA-74-5214; Conf-741105-15) Avail: NTIS HC $3.25

The four-beam laser system is being used to study the irradiation and implosion of small solid spheres of CD2 at laser energies of from 100 to 300 joules. Laser pulse widths of from 1 to 2 nanoseconds are typically employed. The emphasis of these experiments is on correlating the laser input power density with the resulting energy absorption, reflection, and pellet compression. Of particular interest are the various plasma instabilities that were predicted by both analytic theories and computer simulations and their effect upon absorption, reflection, and the generation of hot electrons and superthermal ions.
Author (NSA)

N75-20104# Oak Ridge National Lab., Tenn.
PLASMA PROPERTIES AND PERFORMANCE OF THE 10 cm DUOPIGATRON ION SOURCE
W. L. Stirling, R. C. Davis, T. C. Jernigan, O. B. Morgan, P. M. Ryan, D. E. Schechter, and L. D. Stewart 1974 12 p Presented at the Symp. on Ion Sources and Formation of Ion Beams, Berkeley, Calif., 22 Oct. 1974 Sponsored by ERDA (Conf-741019-6) Avail: NTIS HC $3.25

A scaled-up version of the 7 cm DuoPIGatron was built and the investigation of plasma properties is continuing. Density scans of the 10 cm or scaled-up version show a uniformity of + or - 20% over a 5 cm radius which is slightly better than the + cr - 30 to + or - 35% achieved in the 7 cm source over a 3.5 cm radius. Preliminary RF measurements indicate the presence of a helical instability in agreement with that found in the 5 cm DuoPIGatron. Hydrogen ion beams were extracted from the source at 20 kV using a 7 cm grid pattern which has 209 apertures of 0.150 inches ID and at 25 kV using a 10 cm grid pattern with 365 apertures of the same size. Up to 7A were extracted at 20 kV; however, the target power peaks at a current drain of 4 to 5A. About 45% of the power is deposited on a 10 cm diameter target 125 cm from the source grids. The high voltage is electronically regulated and operation is very steady and reliable. Up to 9A were extracted at 25 kV with an unregulated supply.
Author (NSA)

N75-20105# Max-Planck-Institut fuer Plasmaphysik, Garching (West Germany).
ION SOUND SPECTRUM AND ELECTRON-WAVE INTERACTION IN PERPENDICULAR SHOCKS
D. Biskamp, R. Chodura, and C. T. Dum Jul. 1974 14 p refs (IPP-1/147; IPP-6/126) Avail: ERDA Depository Libraries HC $4.00

A theory is presented for the rotation of the ion acoustic spectrum with respect to the drift velocity as observed in perpendicular shocks. The results of 2D simulation confirm the main points of the theory and represent a direct verification of perturbed orbit theory of strong turbulence.
Author (NSA)

N75-20106# Battelle Pacific Northwest Labs., Richland, Wash.
INTERESTING POSSIBILITIES OF FUSION-FISSION
R. W. Werner, J. D. Lee, R. W. Moir, and G. A. Carlson 1974 5 p refs Presented at 5th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Tokyo, 11 Nov. 1974 Sponsored by ERDA (BNWL-SA-5069; Conf-741105-2) Avail: NTIS HC $3.25

In a world economy highly sensitive to increasing energy demands, it is vital to investigate all viable combinations of energy producing methods. The fusion-fission hybrid is such a combination. The ultimate pure fusion reactor is recognized but it is contended that a step along the way may be fusion-fission. It may decrease the time to a demonstration reactor since the plasma characteristics necessary to achieve fusion-fission are significantly less than those for pure fusion power.
Author (NSA)

N75-20107# Battelle-Northwest, Richland, Wash.
PROGRESS TOWARD THE DEVELOPMENT OF A MIRROR HYBRID (FUSION-FISSION) REACTOR
B. R. Leonard, Jr. and W. C. Wolkenhauer 1974 12 p refs Presented at the 5th Conf. on Plasma Phys. and Controlled Nuclear Fusion Res., Tokyo, 11 Nov. 1974 Sponsored by ERDA (BNWL-SA-4932; Conf-741105-21) Avail: NTIS HC $3.25

The fissile blanket concept, based on a depleted uranium convertor and a slightly enriched uranium high temperature gas cooled reactor technology, was developed. Using the DT plasma constraints and systems analysis, the results of initial condition neutronics calculations were previously reported. These results projected a viable electrical power plant with 2000 MW(th) developed in the blanket, 680 MW(e) net, and probable breeding of both thermally fissile material and tritium in a subcritical fission blanket. The results of neutronics calculations performed through a 200 day operating period are described. These results confirm the performance characteristics originally proposed and, in fact, predict a larger average blanket energy multiplication and more positive fissile and tritium breeding over the operating period. The calculations also demonstrate the necessity of performing calculations during burnup, at operating temperature, to obtain reliable performance parameters.
Author (NSA)

N75-20108# Los Alamos Scientific Lab., N.Mex.
PRELIMINARY STUDY OF PLASMA NUCLEAR REACTOR FEASIBILITY
H. H. Helmick, G. A. Jarvis, J. S. Kendall, and T. S. Latham Aug. 1974 14 p refs
(Contract W-7405-eng-36)
(LA-5679) Avail: NTIS HC $3.25

An engineering working group was formed by the National Aeronautics and Space Administration to assess the feasibility of performing a series of nuclear cavity reactor critical experiments which would provide basic reactor physics and engineering data for future higher power gaseous UF6 and uranium plasma core reactor experiments. Included in the scope of the investigations were estimates of costs and the establishment of a test schedule for the cavity reactor experiments. In addition, residual materials and test facilities formerly used for the solid core nuclear rocket development programs were inventoried and inspected to determine their suitability for use in the series of cavity reactor experiments. The principal conclusions of the study are that (1) residual beryllium reflector segments, control drums and drive motors, and (2) the remote maintenance, assembly, and disassembly building at the Nuclear Rocket Development Station is an ideal facility in which to perform future high power reactor experiments.
Author (NSA)

N75-20109# Air Force Weapons Lab., Kirtland AFB, N.Mex.
OPTICAL PROPERTIES OF LASER PLASMA INTERACTIONS Technical Note, 8 Oct. - 2 Nov. 1973
Robert M. Wyatt Dec. 1973 41 p refs
(AF Proj. 8809)
(AD-A001805; AFWL-DYS-TN-73-102) Avail: NTIS CSCL 20/9

A two-dimensional code has been written to study the optical interactions of laser beams with preformed plasmas. Specifically, simulations of CO2 and ruby lasers beams incident upon the plasmas of exploding wires have been accomplished for different beam configurations to find the optimum configuration for plasma heating.
GRA

N75-20110# Ballistic Research Labs., Aberdeen Proving Ground, Md.
EXPERIMENTAL STUDY OF A LASER SUSTAINED AIR PLASMA Final Report
Dennis R. Keefer, Bruce B. Henriksen, and William F. Braerman Oct. 1974 15 p refs
(DA Proj. 1T1-61101-A-91A)
(AD-A002010; BRL-MR-2416) Avail: NTIS CSCL 20/9

An experiment was performed to determine the temperature distribution within a stationary plasma in atmospheric air, produced by a continuously operating CO2 laser. A peak temperature of 17,000K was found to exist at a point 1.1 cm ahead of the focal point. The radiation surrounding the hot plasma core was found to consist, primarily, of the first negative system of nitrogen.
GRA

N75-20111# Naval Research Lab., Washington, D.C.
ISOTOPE SEPARATION USING MAGNETO-PLASMA INSTABILITIES Final Report
David L. Book Oct. 1974 27 p refs Prepared in cooperation with ONR, Arlington, Va.
(RR0330242)
(AD-A002439; NRL-MR-2908) Avail: NTIS CSCL 18/2

The report briefly describes a design for a continuously operating device which separates one isotopic species of a given element from a mixture. The essential innovation is the use of collisionless plasma instabilities to slow down ions of the desired species from two counter-streaming, initially neutral beams. The relevant processes of excitation, ionization and decay occurring in the laser-irradiated atomic beam are discussed. The plasma instabilities and the braking process in two symmetric counterstreaming beams are analyzed. Also included are a schematic of a plant design and estimated rates and power requirements. GRA

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N75-20112 Purdue Univ., Lafayette, Ind.
AN INVESTIGATION OF THE ELECTRICAL PROPERTIES OF THE ALUMINUM OXIDE-GALLIUM ARSENIDE INTERFACE Ph.D. Thesis
William Benson Donley 1974 92 p
Avail: Univ. Microfilms Order No. 74-26704

An investigation is conducted of the interface state properties of the gallium arsenide - aluminum oxide interface. The GaAs substrates were oriented on the (100), (110), and (111) crystal planes and acceptor densities are included. The insulator was electron beam evaporated from a pellet of pure Al2O3 in the presence of a partial pressure of oxygen. MIS capacitors were fabricated using aluminum as the gate metal. The interface properties measured were the surface state density, trap density and capture cross-section versus surface potential. This data was determined from admittance-voltage measurements of the capacitors in a frequency range of 500 Hz to 30 MHz.
Dissert. Abstr.

N75-20113 Purdue Univ., Lafayette, Ind.
TWO-PHOTON ABSORPTION AND SECOND HARMONIC GENERATION IN SEMICONDUCTORS Ph.D. Thesis
Charles Chung-chi Lee 1974 178 p
Avail: Univ. Microfilms Order No. 74-26740

Two-photon absorption is treated theoretically using second-order perturbation theory. The exciton effect is taken into account for zinc-blende crystal with a simple conduction band and degenerate valence band. Calculations are made also including another energy band besides the conduction band and valence band. Expressions are given for the absorption of photon pairs from one radiation field and for the absorption of two photons, one from each of two different radiations. Theoretical calculations with and without exciton effect being taken into account are carried out by simple computer programs. Experimental studies on two-photon absorption are made on ZnTe, GaAs, InP and InSb. A Q-switched Nd-glass laser is used for the measurements for ZnTe, GaAs and InP. Absorption and photo-conductivity measurements on InP revealed that the effect of absorption of free carriers produced by two-photon excitations is important.
Dissert. Abstr.

N75-20114 Purdue Univ., Lafayette, Ind.
ZERO BIAS TUNNELING INTO VANADIUM-DOPED TITANIUM SESQUIOXIDE Ph.D. Thesis
Peter Clay Eklund 1974 109 p
Avail: Univ. Microfilms Order No. 74-26708

Tunnel junctions formed from evaporated metal contacts on polished surfaces of single crystalline V-doped Ti2O3 are experimentally studied as a function of temperature and magnetic field. Two different modulator circuits were designed and constructed for use in the tunneling measurements. One of them is based on a new feedback method to generate second harmonic signals directly proportional to the second derivative of the tunneling characteristic. The theoretical explanation is in good agreement with the experimental data. Also, an additional low bias inelastic tunnel effect was observed in Pb: (Ti2O3).98-V2O3).02 junctions. This is believed to correlate with the low temperature anomalous bulk negative magneto-resistance in this compound.
Dissert. Abstr.

N75-20115 Northwestern Univ., Evanston, Ill.
MANY-ELECTRON CORRELATION EFFECTS ON THE ENERGIES AND CONFIGURATION OF LATTICE DEFECTS IN SIMPLE METALS Ph.D. Thesis
Pabbisetty Venkata Seshagiri Rao 1974 231 p
Avail: Univ. Microfilms Order No. 74-28723

A theoretical study is presented of the many-electron correlation effects on atomic configuration and energies of stacking faults and single vacancies in sodium and aluminum. The study is based on the pseudopotential theory, with pseudopotential and dielectric function as its two basic ingredients. Using the nonlocal optimized model pseudopotential of Shaw and the recent self-consistent treatment of electron correlations in electron liquid by Vashishta and Singwi a pseudopotential form factor, and an ion-electron-ion G(q) function were constructed to generate an effective interionic potential for each metal. They give satisfactory agreement with measurable perfect-state-properties, such as phonon dispersion relations, liquid resistivity, and elastic constants. Importance of accurate consideration of many-electron correlations is demonstrated by considering three other dielectric functions, based on approximations due to Hubbard, Geldart and Vosko, and Singwi et al. Dissert. Abstr.

N75-20116 Cornell Univ., Ithaca, N.Y.
AVALANCHE MULTIPLICATION MEASUREMENTS IN GALLIUM ARSENIDE
Daniel McCarthy 1974 180 p
Avail: Univ. Microfilms Order No. 74-26287

Avalanche multiplication measurements were made on GaAs Schottky barrier structures. The structures investigated were fabricated from either chromium doped semi-insulating material or N on N(+) epitaxial material. Expressions were obtained for calculating the ionization rates for electrons and holes from the measured multiplication factors for a variety of structures. In the chromium doped material, it was found that a filament formation within the material would usually cause the structures to fail at field strengths below where avalanche multiplication could be observed. However, for some of the samples investigated a multiplication was observed before the structures failed indicating a considerably higher ionization rate at these field strengths than predicted from previous experiments. For many of the structures made from expitaxial material, it was found that high fields present at the surface of the samples would cause a breakdown before the desired bulk breakdown condition was reached. Various different structures were fabricated in an attempt to reduce this surface field, but none was found to be successful for the particular materials used. An effective ionization rate was measured using a bonded IMPATT type structure. This result was found to be in good agreement with the results obtained by others using p-n junctions. Dissert. Abstr.

N75-20117 University of Southern Calif., Los Angeles.
INVESTIGATION OF SEMIINSULATING GaAs BY MEANS OF INFRARED MODULATED CATHODOLUMINESCENCE AND SPECIMEN CURRENT Ph.D. Thesis
Wen Nan Lin 1974 132 p
Avail: Univ. Microfilms Order No. 74-28452

A technique for the measurement of the energy of deep impurity levels in semiconductors was investigated. Several single crystal GaAs samples were used in the experiments performed at 300 K and 104 K, and Semi-insulating GaAs samples showed infrared modulation cathodoluminescence and specimen current. The infrared light induced changes in cathodoluminescence and specimen current as a function of wavelength were measured simultaneously, and the thresholds for these changes were used to deduce the energy of the deep impurity levels. Electron beam voltage dependence of the modulation effect showed drastic descrease of the modulation effect with increasing beam voltage. This seemed to indicate that modulation occurring at the surface

and inside the space charge region plays an important role in accounting for the observed infrared modulation effect. Two regions with different dependence of absolute cathodoluminescence change on beam voltage were observed in Cr-doped GaAs. This effect has been used to estimate the depth of the space charge region in these samples. Dissert. Abstr.

N75-20118 Northwestern Univ., Evanston, Ill.
IMPURITY-BAND TUNNELING IN TRANSISTOR JUNCTIONS Ph.D. Thesis
Robert Allen Pryor 1974 107 p
Avail: Univ. Microfilms Order No. 74-28721

Excess transistor currents which are not predicted and cannot be explained by the basic, one-dimension, Shockley-type transistor theory are observed in n-p-n, double-diffused, silicon transistors below approximately 150 K. These anomalous base and collector currents occur in the low-level injection region of operation and appear as bumps in the semi-logarithmic I-V characteristic curves. The excess currents may be explained by considering the behavior of donor and acceptor impurity levels within the semiconductor bandgap. The formation of a donor impurity band in the emitter-base junction space-charge region is likely for the type of n-p-n transistors considered. The excess base current may be explained by a two-step electronic transition process. The first step involves the tunneling of emitter conduction band electrons into the donor impurity band near the center of the space-charge region. Dissert. Abstr.

N75-20119 Tufts Univ., Medford, Mass.
SUPERCONDUCTING GERMANIUM TELLURIDE IN THE TELLURIUM-GERMANIUM-ARSENIC SYSTEM Ph.D. Thesis
Joel Arthur Gerber 1974 232 p
Avail: Univ. Microfilms Order No. 74-28563

Studies of alloys in the Te-Ge-As system showed that superconductivity in this system is due to the presence of the superconducting semiconductor GeTe. Scanning electron micrographs show that the polycrystalline alloy Te0.81Ge0.15As0.04 (composition in at.%), and other similar alloys, solidify in a lamellar structure of alternating GeTe and Te lamellae. Given the proper heat treatment the alloy Te0.81Ge0.15As0.04 has a transition temperature (0.8K-0.9K) over twice as high as pure GeTe. Heat capacity measurements show this to be a bulk transition of the entire GeTe-phase found in this alloy and that for this GeTe-phase the thermodynamic critical field has the value H sub c (0) =50G. The normal state electronic specific heat of the GeTe-phase (138T erg/g-K squared) is found to be over twice as large as for pure GeTe. For the highest transition temperatures X-ray diffraction experiments show that the GeTe lattice is rhombohedrally distorted with respect to pure bulk GeTe and that the rhombohedral angle is 86.5 deg + or - 0.5 deg. Dissert. Abstr.

N75-20120 Florida Univ., Gainesville.
CARRIER DOMAIN ELECTRONICS: A SPATIALLY DISTRIBUTED APPROACH TO FUNCTIONAL INTEGRATED CIRCUITS Ph.D. Thesis
James Edwin Smith 1974 218 p
Avail: Univ. Microfilms Order No. 74-27890

A carrier domain device (CDD) fabricated using standard planar diffused silicon processing techniques and exhibits base-emitter and base-collector transfer characteristics which are determined primarily by the device's planar geometry is described and evaluated. A base-emitter structure for carrier domain operation was designed as a study tool. A collector design which accomplishes current division which is linearly dependent upon a single coordinate axis is proposed as optimum. Collector structures were designed for use with the base-emitter structure. The two collector designs permit experimental measurement of the motion of the domain centroid along two different coordinate axes. These designs permit the two-dimensional motion of the domain centroid to be completely determined experimentally. Two CDD's which utilize these base-emitter and collector designs were fabricated and experimentally characterized. The agreement obtained between the theoretically predicted and experimentally measured base-emitter and base-collector transfer characteristics of the devices studied indicates that a macroscopic, two-dimensional representation is entirely sufficient for an accurate description of the terminal characteristics of a CDD. Dissert. Abstr.

N75-20121 Brigham Young Univ., Provo, Utah.
A FIRST PRINCIPLES THEORETICAL DESCRIPTION OF THE NEGATIVE SLOPE MELTING PHENOMENON IN GROUP 4 SEMICONDUCTORS Ph.D. Thesis
Gregory Leigh Warren 1974 273 p
Avail: Univ. Microfilms Order No. 74-28391

A negative-slope melting curve was calculated for the elements silicon and germanium from first principles. Three adjustable parameters obtained from the theory were chosen to fit the calculated melting point and volumes to experiment at zero pressure resulting in a good fit of the theory to experiment for pressures up to approximately 25 kilobar. The metallic liquid state of these elements was described using the Mansoori-Canfield variational approach with a hard-sphere reference system. The solid state was described by a system consisting of interacting ions, covalent-bond charges, and electrons. A variational approach was also used to describe the solid state. Dissert. Abstr.

N75-20122 Laboratoire Central de Recherches Thomson-CSF, Orsay (France). Lab. Interactions Lumiere Matiere.
PHOTOINDUCED CHANGES OF REFRACTIVE INDEX IN FERROELECTRIC MATERIALS Final Report
F. Micheron Dec. 1973 104 p refs In FRENCH; ENGLISH summary
(Contract DGRST-72-7-0091)
(LCR-73-219/R/G5) Avail: Issuing Activity

The electrical fixation method was used in undoped (Sr, Ba) Nb2 O6, which needs 20 J/sq cm at lambda =488 nm for obtaining the maximum refractive index change beta n =0.00042. Ionic substitutions were made in KNbO3, BaTiO3, and (Pb, La) zeta r TiO3; the largest effect was obtained with the Fe3(+) ion, and was interpreted for BaTiO3 in terms of a photocurrent model using two levels in the bandgap. Two new processes were discovered: the electrical switching of two recorded images, and the selective optical erasure. A model for the photosensitivity of dielectrics was proposed which explains the effects observed with and without an applied field. Author (ESRO)

N75-20123 Centre National de la Recherche Scientifique, Bellevue (France). Lab. de Physique du Solide.
WINDOW PHOTOVOLTAIC DETECTORS Final Report [DETECTEURS PHOTOVOLTAIQUES A FENETRE]
C. Verie Mar. 1974 40 p refs In FRENCH; ENGLISH summary
(Contract DGRST-71-7-2620)
Avail: Issuing Activity

Infrared photovoltaic detection, based on the bandgap absorption edge shift of semiconductors which is due to the band filling effects of the p-n junction majority electrons was studied. Intra- and interband contributions to the optical dielectric constant of HgTe and HgCdTe alloys, with n and p type doping were investigated. The window photovoltaic effect was experimentally produced in the range 8-12 micron, with illumination of the n layer with a doping level between 10 to the sixteenth and 10 to the seventeenth/cu cm, and internal quantum efficiency inferior to 0.5. Detectivity, heterodyne detection threshold of CO2 laser and flat frequency response limits are given. ESRO

N75-20124 Radiotechniques S. A., Caen (France). Div. Industrielle et Technique.
STUDY OF EPITAXIAL GROWTH OF GaAsP ON LARGE SECTION GaAs AND GROWTH IN SOLUTION OF BULK GALLIUM PHOSPHIDE CRYSTALS Final Report [ETUDE DE L'ELABORATION DES STRUCTURES GaAsP SUR GaAs DE GRANDE SECTION ET DE LA CROISSANCE EN SOLUTION DE MONOCRISTAUX MASSIFS DE PHOSPHURE DE GALLIUM]
J. P. Biet, G. Jacob, P. Pinchon, and G. Poiblaud 26 Nov. 1973 42 p refs In FRENCH
(Contract DGRST-72-7-0515)
Avail: Issuing Activity

Thermophysical conditions of epitaxial growth of GaAsP on large section (18 sq cm) GaAs plates cut from ingots were

studied for control of crystalline quality, electrical, and luminescence characteristics of the strata. Bulk gallium phosphide crystals were grown from gallium rich solutions. Thermal difficulties and limitations are discussed. The resulting crystals are evaluated for crystallinity, finity, electrical, and optical properties. ESRO

N75-20125# Northeastern Univ., Boston, Mass. Dept. of Physics.

THIRTY-TWO VERTEX MODEL ON A TRIANGULAR LATTICE

J. E. Sacco and F. Y. Wu Feb. 1975 19 p refs Sponsored in part by NSF

(NUB-2250) Avail: NTIS HC $3.25

The thirty-two vertex model is solved exactly in two special cases. In one case the model is reducible to a three-spin Ising model and has the exponents alpha = alpha prime = 2/3. The other soluble case is the free-fermion model which exhibits the Ising behavior but may possess multiple transitions. Author

N75-20126*# Alabama Univ., Huntsville. School of Graduate Studies and Research.

THE EFFECTS OF SHOCK WAVE COMPACTION ON THE TRANSITION TEMPERATURES OF A15 STRUCTURE SUPERCONDUCTORS Final Report

Guenther H. Otto Aug. 1974 51 p refs Sponsored in part by ARPA

(Contract NAS8-30244)

(NASA-CR-120708; UAH-RR-156) Avail: NTIS HC $4.25 CSCL 20L

Several superconductors with the A15 structure exhibit a positive pressure coefficient, indicating that their transition temperatures increase with applied pressure. Powders of the composition Nb3Al, Nb3Ge, Nb3(Al0.75Ge0.25), and V3Si were compacted by explosive shock waves. The superconducting properties of these materials were measured before and after compaction and it was found that regardless of the sign of the pressure coefficient, the transition temperature is always lowered. The decrease in transition temperature is associated with a decrease in the particle diameter. The shock wave passage through a 3Nb:1Ge powder mixture leads to the formation of at least one compound (probably Nb5Ge3). However, the formation of the A15 compound Nb3Ge is not observed. Elemental niobium powder can be compacted by converging shock waves close to the expected value of the bulk density. Under special circumstances a partial remelting in the center of the sample is observed. Author

N75-20127# Council for Scientific and Industrial Research, Pretoria (South Africa).

TRANSFER PHENOMENA IN LIQUID SEMICONDUCTORS OF THE Tl-S SYSTEM

D. K. Belascenko, I. A. Magidson, and F. L. Konopel'ko 1974 13 p refs Transl. into ENGLISH from Ukr. Fiz. Zh. (Ukrainian SSR) v. 12, no 1, 1967 p 66-71

(CSIR-Trans-1172) Avail: NTIS HC $3.25

The dependence of the mean diffusion coefficient of a solution, and the effective charges of Tl and S on temperature and concentration are discussed. The results are analyzed from the point of view of the constitution and mechanism of conductivity of the substances. The alloy samples were prepared from metallic thallium of the 'TU' grade and spectroscopically pure sulfur in a vacuum. M.J.S.

N75-20128# Cornell Univ., New York.

DETECTION OF THE PERIODIC STRUCTURE OF HIGH ANGLE TWIST BOUNDARIES. 2: HIGH RESOLUTION ELECTRON MICROSCOPY STUDY

T. Y. Tan, S. L. Sass, and R. W. Balluffi Aug. 1974 25 p refs

(Contract AT(11-1)-3158)

(COO-3158-33; Rept-2294) Avail: NTIS HC $3.25

High resolution electron microscopy was used to image directly the O-lattice of (001) twist boundaries with misorientations up to 25 deg and O-lattice spacings as small as 7 A. The results were entirely consistent with the conclusions reached on the basis of the diffraction experiments that are described. An experimental method was devised for determining whether the O-lattice was imaged by conventional diffraction strain contrast or by interference strain contrast which arises from interference between fcc and O-reflections resulting from the periodic structure of the boundary. It was demonstrated that spacings down to about 34 A were imaged mainly by means of diffraction strain contrast, while networks with spacings of about 16 A or less were imaged mainly by means of interference strain contrast. Author (NSA)

N75-20129# Sandia Labs., Livermore, Calif.

PROTON INDUCED ELECTRON EMISSION FROM CHARACTERIZED NIOBIUM SURFACES

R. G. Musket Sep. 1974 23 p refs Presented at 21st Natl. Symp. on the Am. Vacuum Soc., Anaheim, Calif., 19 Oct. 1974 Sponsored by ERDA

(SAND-74-8605; Conf-741015-6) Avail: NTIS HC $3.25

Both the electron emission coefficient (electrons/ion) and the energy distribution of emitted electrons were determined for bombardment of polycrystalline niobium by 30 to 400 keV protons. In situ characterization of the niobium surfaces was accomplished using electron-induced Auger electron spectroscopy. Emission coefficient measurements were made for protons incident along the surface normal and along the axis at 45 from the surface normal. Electron energy distributions were determined using a hemispherical retarding analyzer with the proton beam at 45 from the surface normal and at 90 from and coplanar with the axis of the analyzer. The results are discussed and interpreted with reference to electron emission theories and previous experiments. Author (NSA)

N75-20130# National Accelerator Lab., Batavia, Ill.

SUPERCONDUCTING COIL TRAINING AND INSTABILITIES DUE TO THE BAUSCHINGER EFFECT

J. R. Heim 30 Sep. 1974 10 p refs Presented at the Applied Superconductivity Conf., Oakbrook, Ill., 30 Sep. 1974 Sponsored by ERDA

(Conf-740957-11) Avail: NTIS HC $3.25

For many years the marginal performance of many superconducting coils was tolerated because of a lack of understanding as to the cause of the observed effects. Study efforts and laboratory experiments have identified electrical losses associated with coil performance but unidentified mechanical losses which generate heat and degrade coil performance were overlooked. The inelastic behavior of superconducting composite conductors which must be considered if coil performance is to be reasonably evaluated are described. The experimental techniques used and the results obtained are described. The significance of the results is assessed and methods of eliminating mechanical losses are described. A new process for stabilizing the superconductor matrix metal, the PWP process (post wind preload) is presented. Author (NSA)

N75-20131# Rutgers Univ., New Brunswick, N.J. Dept. of Electrical Engineering.

TRANSPORT, DIELECTRIC AND SWITCHING PROPERTIES OF TRANSITION METAL OXIDES Final Report, 1 Apr. 1971 - 15 Jun. 1974

N. Fuschillo and B. Lalevic Sep. 1974 17 p refs

(Grant AF-AFOSR-2043-71; AF Proj. 9763)

(AD-A001842; AFOSR-74-1880TR) Avail: NTIS CSCL 20/12

Transport mechanisms in amorphous films of transition metal oxides and polycrystalline films of CoO, CoO(Li), Nb2O5, and TiO2 are of the Poole-Frenkel or Poole Effect type. In NiO and NiO(Li) films the transport mechanism is explained by the small-polaron conduction. Dielectric dispersion is due to the non-adiabatic hopping of charge carriers at low frequencies and adiabatic hopping at high frequencies. A novel type of switching is observed with switching, delay and recovery times of less than 3 nsec in Nb-Nb2O5-Nb with sputtered Nb counterelectrodes. GRA

N75-20132# Ballistic Research Labs., Aberdeen Proving Ground, Md.

LIGHT INDUCED MODULATION OF ABSORPTION (LIMA) IN COPPER-DOPED SINGLE CRYSTALS CdS PLATELETS. PART 2: THEORETICAL

William F. Braerman Oct. 1974 54 p refs

(DA Proj. 1J1-61101-A-91A)

(AD-A002051; BRL-1746-Pt-2) Avail: NTIS CSCL 20/12

Copper-doped CdS single crystal platelets were excited with chopped laser light and, by using a weak light probe in the extrinsic range, modulated optical transmission was detected. Broadband modulated transmission was detected from 5200A to 10,000A with very little structure. The modulated transmission appeared in two ways. When the phases of the modulated transmission and chopped laser light were nearly equal, enhanced transmission was observed. This was detected with a weak light probe from 5200A to 5600A and corresponded to the in-phase filling of electrons into electron traps due to chopped laser excitation. By filling electron traps, electron transitions from the valence band to these levels are made less probable and transmission is increased throughout the crystal. An apparent discrepancy was observed between the magnitude of our optical transmission measurements and predictions of a simple theoretical model constructed. This can be resolved by assuming that a deeper trap contributes to the modulation. GRA

N75-20133# Yale Univ., New Haven, Conn. Dept. of Engineering and Applied Science.

INFRARED DEVICES RELATED TO CONTINOUSLY VOLTAGE TUNEABLE LINE ABSORPTION IN SURFACE QUANTIZATION Final Report

Robert G. Wheeler 31 Oct. 1974 36 p refs

(Grant AF-AFOSR-2266-72)

(AD-A001941; AFOSR-74-1877TR) Avail: NTIS CSCL 20/12

The aim of this research has been to refine the physics associated with the energy levels involved at the interface between silicon and silicon dioxide as exemplified in an n-channel MOSFET structure. Demonstration of the photoresistive response of devices to radiation resonant with energy levels in the inversion layer has allowed characterization of a voltage tuneable infrared detector-spectrometer. Operating at 4.2K, typical devices have continuous tuneability from 8 mev (about 150 micrometers) to 30 mev (about 40 micrometers), a band width of approximately 1 mev, a response time of 0.00025 seconds and a noise equivalent power (NEP) of approximately 10 to the -11th power watts. Outlines for methods of improvement in terms of band range, band width and noise equivalent power have been obtained. GRA

N75-20134# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Macromolecular Science.

SCANNING FOR FERROELECTRICITY IN POLYCRYSTALLINE MATERIALS

M. Litt, C. Hsu, P. Basu, and S. M. Aharoni 15 Nov. 1974 28 p refs

(Contract N00014-67-A-040-0011)

(AD-A001804; TR-2) Avail: NTIS CSCL 20/12

A method has been developed which can scan rapidly for ferroelectricity in polycrystalline compounds. This consists of measuring the dielectric constant of a polycrystalline pellet as a function of temperature. If any dielectric anomalies are found where the dielectric and loss tangent peaks are independent of frequency, a solid/solid first order transition has been found. If the sample is held under a voltage gradient while the temperature is dropped through the transition temperature, charge storage shows poling of the sample and therefore ferroelectric behavior. The procedure was demonstrated on thiourea, a known ferroelectric. 2-Ethyl benzimidazole showed the same phenomena at a transition temperature of -90C and is probably a new ferroelectric material. GRA

N75-20135# Missouri Univ., Rolla. Materials Research Center.

SURFACE ELECTRON STATES AND SURFACE STRUCTURAL STUDIES OF ELECTRONIC MATERIALS Final Report, 1 Sep. 1973 - 30 Jun. 1974

W. J. James Aug. 1974 12 p refs

(Contract F44620-69-C-0122; AF Proj. 9761)

(AD-A001929; AFOSR-74-1790TR) Avail: NTIS CSCL 20/12

Three research projects are discussed: (1) Effort was concentrated on surface electromagnetic wave studies of metals, dielectrics, semiconductor (small particles), and ferroelectric and magnetic materials. Materials characterization, new physical phenomena, and new communications techniques were sought. (2) Ion implantation can transform crystalline silicon to amorphous silicon. This transformation is being studied by electron spin resonance measurements. Of principle interest has been the determination of the critical ion dose, the lowest dose at which the implanted layer becomes completely amorphous. (3) A study was made of the interface between carbon substrates and nickel films deposited on those substrates. The motivation for this work is the problem of producing graphite fiber-metal composites having high strengths at high temperature (= 1000C) in oxidizing atmospheres. GRA

N75-20136# Washington State Univ., Pullman. Shock Dynamics Lab.

KINETICS OF SHOCK-INDUCED PHASE TRANSITIONS Annual Report

George E. Duvall Sep. 1974 83 p refs

(Contract DAAG46-73-C-0104; DA Proj. 1W0-62105-A-861)

(AD-A002581; WSU-SDL-74-03; AMMRC-CTR-74-62) Avail: NTIS CSCL 20/12

Possible practical effects of phase transitions in structural materials are discussed and a rationale is developed for investigating the kinetics of transitions induced by shock waves. A gas gun experiment in two-dimensional steady plane flow is described. Atomic motions required for transition from the NaCl form of KCl to the CsCl lattice are described in detail. Some experiments with KCl which were intended to relate ease of transition to atomic motions are described. They suggest that those transitions involving minimal motions may occur most rapidly, but they are not conclusive. They also show evidence of thermal-activated diffusion at 85C. Effects of shear stress on the equilibrium of two phases are discussed for a very simple case and are shown to be sensitive to shear stress. A more general formulation shows that conditions for phase equilibrium, even without surface energies, can differ markedly for equality of the simple Gibbs functions. An extensive bibliography is appended. GRA

N75-20137# Raytheon Co., Waltham, Mass.

TEMPERATURE DEPENDENCE OF RAYLEIGH WAVE DELAY LINE MATERIALS Final Report, 1 Apr. 1971 - 30 Sep. 1974

Manfred B. Schulz Dec. 1974 79 p refs

(Contract N00014-71-C-0234; NR Proj. 017-508)

(AD-A002446; S-1782) Avail: NTIS CSCL 20/12

The variation of surface acoustic wave delay time with temperature was measured for many orientations of the commonly used piezoelectric substrate material and some uncommon ones as well as for composite devices with oriented ZnO overlay films. The single crystal materials studied included: quartz, LiNbO3, LiTaO3, Bi12GeO20, ZnO, and TeO2. Accurate measurements of electromechanical coupling constant were also performed using two sensitive techniques. The mass loading of aluminum thin films on various substrates was experimentally determined. A brief investigation into the viability of electrostriction as a mechanism for surface acoustic wave transduction was performed. Analysis and measurements of temperature effects on chirp pulse compression signal processing devices was performed. GRA

N75-20138# Pennwalt Corp., King of Prussia, Pa.

THE EFFECTS OF STRUCTURAL DISORDER ON ONE-DIMENSIONAL ANTIFERROMAGNETIC CHAINS Ph.D. Thesis

J. C. Scott (Pennsylvania Univ., Philadelphia), A. F. Garito (Pennsylvania Univ., Philadelphia), A. J. Heeger (Pennsylvania Univ., Philadelphia), P. Nannelli, and H. D. Gillman Dec. 1974 14 p refs Sponsored in part by NSF

(Contracts N00014-69-C-0122; DAHC15-72-C-0174; ARPA Order 2043; NR Proj. 356-408)

(AD-A002449; TR-13) Avail: NTIS CSCL 20/12

Magnetic measurements are reported for three polychromium-phosphinates. The results imply that these transition metal polymers comprise a class of one-dimensional antiferromagnetic chains with J/k approximately 3K and with a varying degree of crystallinity. Structural disorder is found to limit the range of spin correlations and, in the extreme case, prohibits extended short range order. Author

N75-19287 Case Western Reserve Univ., Cleveland, Ohio. Dept. of Fluid, Thermal and Aerospace Sciences.

SKYLAB SCIENCE DEMONSTRATIONS
S. Ostrach *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 11-18 (For availability see N75-19285 11-12)

N75-19288* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SKYLAB EXPERIMENTS ON SEMICONDUCTORS AND ALKALI HALIDES
C. A. Lundquist *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 19-26 refs (For availability see N75-19285 11-12)

N75-19291* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ASTP MULTIPURPOSE FURNACE EXPERIMENTS
C. A. Lundquist *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 65-69 refs (For availability see N75-19285 11-12)

N75-19299 Stuttgart Univ. (West Germany). Kristallab.
SINGLE CRYSTALS OF ELECTRONIC MATERIALS GROWN IN A SPACE ENVIRONMENT
K. W. Benz *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 163-169 refs (For availability see N75-19285 11-12)

N75-19308 Centre National de la Recherche Scientifique, Meudon (France).
ELECTRONIC MATERIALS: PURIFICATION AND SPACE CONDITIONS
H. Rodot *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 243-246 (For availability see N75-19285 11-12)

N75-19309 Laboratoires d'Electronique et de Physique Appliquee, Paris Limeil-Brevannes (France).
GROWTH OF LARGE SINGLE CRYSTALS AND PERFECTION PROBLEMS CONNECTED WITH THE GRAVITATIONAL FIELD
C. Belouet *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 247-259 refs (For availability see N75-19285 11-12)

N75-19310 Battelle Inst., Frankfurt am Main (West Germany).
CRYSTAL GROWTH OF OXIDES USING A CO2 LASER
R. Beck *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 261-265 (For availability see N75-19285 11-12)

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer*.

N75-20139* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
CONDENSATE REMOVAL DEVICE FOR HEAT EXCHANGER Patent
Raymond B. Trusch (Hamilton Std. Div., United Aircraft Corp., Windsor Locks, Conn.) and Edward W. OConnor, inventors (to NASA) (Hamilton Std. Div., United Aircraft Corp., Windsor Locks, Conn.) Issued 4 Mar. 1975 9 p Filed 31 Aug. 1973 Supersedes N73-32823 11 - 23, p 2856 Sponsored by NASA
(NASA-Case-MSC-14143-1; US-Patent-3,868,830; US-Patent-Appl-SN-393526; US-Patent-Class-62-290; US-Patent-Class-62-93; US-Patent-Class-62-285; US-Patent-Class-62-288; US-Patent-Class-62-289; US-Patent-Class-62-317; US-Patent-Class-165-110; US-Patent-Class-165-111) Avail: US Patent Office CSCL 20M

A set of perforated tubes disposed at the gas output side of a heat exchanger, in a position not to affect the rate of flow of the air or other gas is described. The tubes are connected to a common manifold which is connected to a sucking device. Where it is necessary to conserve and recirculate the air sucked through the tubes, the output of the manifold is run through a separator to remove the condensate from the gas. The perforations in the slurper tubes are small, lying in the range of 0.010 inch to 0.100 inch. The tubes are disposed in contact with the surfaces of the heat exchanger on which the condensate is precipitated, whether fins or plates, so that the water may be directed to the tube openings by means of surface effects, together with the assistance of the air flow. Only about 5 percent of the air output need be thus diverted, and it effectively removes virtually all of the condensate. Official Gazette of the U.S. Patent Office

N75-20140* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SELF-REGULATING PROPORTIONALLY CONTROLLED HEATING APPARATUS AND TECHNIQUE Patent
Maxwell G. Strange, inventor (to NASA) Issued 4 Mar. 1975 6 p Filed 27 Feb. 1974 Supersedes N74-19583 (12 - 10, p 1233)
(NASA-Case-GSC-11752-1; US-Patent-3,869,597; US-Patent-Appl-SN-446569; US-Patent-Class-219-505; US-Patent-Class-219-497; US-Patent-Class-219-501) Avail: US Patent Office CSCL 20M

A self-regulating proportionally controlled heating apparatus and technique is provided wherein a single electrical resistance heating element having a temperature coefficient of resistance serves simultaneously as a heater and temperature sensor. The heating element is current-driven and the voltage drop across the heating element is monitored and a component extracted which is attributable to a change in actual temperature of the heating element from a desired reference temperature, so as to produce a resulting error signal. The error signal is utilized to control the level of the heater drive current and the actual heater temperature in a direction to reduce the noted temperature difference. The continuous nature of the process for deriving the error signal feedback information results in true proportional control of the heating element without the necessity for current-switching which may interfere with nearby sensitive circuits, and with no cyclical variation in the controlled temperature.
Official Gazette of the U.S. Patent Office

N75-20141# Westinghouse Electric Corp., Pittsburgh, Pa. Astronuclear Lab.
INVESTIGATION OF HIGH PERFORMANCE THERMAL INSULATION SYSTEMS Final Report
R. C. Svedberg Aug. 1974 145 p refs
(Contract AT(11-1)-2239)
(COO-2239-001; WANL-M-FR-004) Avail: NTIS HC $5.75

The practicability of developing a reliable high-performance thermal insulation for a completely implantable nuclear powered artificial heart was demonstrated. Vacuum multifoil insulation technology was refined; state-of-the-art advances in fabrication techniques and guarded heater thermal performance evaluations are reported. Concentric electroformed nickel cups were utilized to eliminate high heat loss areas such a mitred corner joints and inter-layer compression resulting from the spiral wrap configuration previously constituting the state-of-the-art systems. Heat losses of 0.043 watts/sq cm were measured using only 20 concentric cups in a closed end-right circular cylinder configuration at 870 C. In addition, plasma spraying of ZrO2 spacers was evaluated along with other spacer fabrication techniques such as slurry painting, phosphate bonding and anodization of oxides on the foils. Author (NSA)

N75-20142# Naval Research Lab., Washington, D.C.
THERMODYNAMICS OF NEGATIVE-TEMPERATURE EQUILIBRIA IN GUIDING-CENTER PLASMAS
D. L. Book, S. Fisher, and B. E. McDonald Oct. 1974 16 p refs
(NRL Proj. A03-16)
(AD-A002196; NRL-MR-2924) Avail: NTIS CSCL 20/10

The sinh-Poisson equation describing two-dimensional steady state distributions of elements with a logarithmic interaction potential (charged filaments executing guiding center motion; quantized vortex lines or rotons) is solved numerically. Multiple solutions are obtained for the case of negative temperatures. These have a simple thermodynamic interpretation which agrees with the results of numerical simulations. The results are related

to numerical experiments and observations of vortex filaments in liquid He4. GRA

N75-20212 European Space Research Organization, Paris (France).
SOME NOTES ON THE THERMODYNAMICS OF THRUST REVERSAL IN FLIGHT
Pierre Garriere *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1974-2 (ESRO-TT-113) Dec. 1974 p 86-88 Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1974-2, Mar.-Apr. 1974 p 107 (For availability see N75-20207 11-99)

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N75-20143# Joint Publications Research Service, Arlington, Va.
LEGAL STATUS, ADMINISTRATIVE ORGANS, FUNCTIONS OF USSR ACADEMY OF SCIENCES
V. A. Dozortsev 19 Mar. 1975 15 p refs Transl. into ENGLISH from Sov. Gos. i Pravo (Moscow), no. 11, 1974 p 19-26
(JPRS-64359) Avail: NTIS HC $3.25

A description of the functions and activities of the U.S.S.R. Academy of Sciences is presented. A definition of its legal status as presented in a number of documents is included along with its structure and administrative organs. Author

N75-20144# Joint Publications Research Service, Arlington, Va.
EXPERIENCE IN PROGRAMMED TRAINING FOR STUDENTS
P. M. Litvinenko 10 Mar. 1975 7 p Transl. into ENGLISH from Med. Zh. Uzbekistansk. (Tashkent), no. 3, 1974 p 61-64
(JPRS-64277) Avail: NTIS HC $3.25

A review of the quality of programmed, machine-independent teaching methods is presented. An automatic information unit was used along with an electrical testing unit. Informational materials were developed, and the student is able to check his knowledge or receive consultation. Author

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N75-20145# California Univ., Livermore. Lawrence Livermore Lab.
TESTING AND EVALUATION OF INFORMATION SECURITY IN LARGE SYSTEMS
R. P. Abbott Sep. 1974 28 p Sponsored by AEC
(UCRL-76114) Avail: NTIS HC $3.75

The problem of protecting the security of large time-sharing multiterminal computer systems is complicated by the fact that the programs controlling the execution of its tasks (i.e., the operating system) are susceptible to unauthorized control, deception or compromise. The current state of research in operating system security is described and the work of one such research activity, the LRL RISO Project (for Research In Secured Operating Systems) is examined in detail. Also discussed are operating-system security aspects of Control Data Corporation 6000 and 7000 series machines. Author (NSA)

N75-20146# California Univ., Berkeley. Operations Research Center.
OPTIMAL ALLOCATION OF RESOURCES IN SYSTEMS
C. Derman, G. J. Lieberman, and S. M. Ross Oct. 1974 24 p refs
(Contract N00014-69-A-0200-1036; NR Proj. 042-238)
(AD-A001126; ORC-74-29; ARO-12549-2-M) Avail: NTIS CSCL 12/2

In the design of a new system, or the maintenance of an old system, allocation of resources is of prime consideration. In allocating resources, it is often beneficial to develop a solution that yields an optimal value of the system measure of desirability. In the context of the problems considered in this paper, the resources to be allocated are components already produced (assembly problems) and money (allocation in the construction or repair of systems). The measure of desirability for system assembly will usually be maximizing the expected number of systems that perform satisfactorily and the measure in the allocation context will be maximizing the system reliability. Results are presented for these two types of general problems in both a sequential (when appropriate) and non-sequential context. GRA

N75-20147# Naval Weapons Engineering Support Activity, Washington, D.C.
CONFIGURATION ACCOUNTING SYSTEM FOR TACTICAL ELECTROMAGNETIC EQUIPMENT AND ORDNANCE Final Report
William C. Booth Oct. 1974 50 p refs
(AD-A002703) Avail: NTIS CSCL 15/5

The report describes a system that displays selected Navy shipboard tactical electromagnetic equipment and ordnance equipment, and that can project, based upon current planning information, ship/equipment configurations for up to 20 years. The system, which is written in COBOL, is currently installed on a Honeywell 2061 at the U.S. Naval Ordnance Station, Indian Head, Maryland. GRA

N75-20148# Army Foreign Science and Technology Center, Charlottesville, Va.
DEFINITION OF A DIMENSIONLESS VALUE OF A QUANTITATIVE INDEX CHARACTERIZING THE PERFORMANCE OF A SCIENTIFIC RESEARCH INSTITUTE
R. S. Amirbekyan 7 Jun. 1974 15 p refs Transl. into ENGLISH from Naukovedenie Inform. Resp. Mezhved. Sb. (USSR), no. 5, 1972 p 76-81
(AD-A002715; FSTC-HT-23-0217-74) Avail: NTIS CSCL 05/7

A composite index in the form of the weighted mean of the individual indices is proposed as a measure of the performance level of a Scientific Research Institute in an Industry. The measure can also be used to compare the performance levels of a number of Institutes in the same industry. GRA

N75-20206 Joint Publications Research Service, Arlington, Va.
CPM AND PERT METHODS APPLIED IN RESEARCH AND DEVELOPMENT
Jerzy Wyszomirski *In its* Transl. on Eastern Europe: Sci. Affairs, No. 454 (JPRS-64093) 12 Feb. 1975 p 27-35 Transl. into ENGLISH from Inwestycje i Budownictwo (Warsaw), no. 11, Nov. 1974 p 36-40 (For availability see N75-20204 11-99)

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N75-20149*+ National Aeronautics and Space Administration, Washington, D.C.
NASA PATENT ABSTRACTS BIBLIOGRAPHY, A CONTINUING BIBLIOGRAPHY, JANUARY 1975. SECTION 1: ABSTRACTS
Jan. 1975 92 p refs
(NASA-SP-7039(06)-Sect-1) Avail: NTIS HC $4.00 CSCL 05B

Patents and applications for patent introduced into the NASA scientific and technical information system are cited. Each entry consists of a citation, an abstract, and a key illustration selected from the patent or application for patent. The patent and application for patent citations are indexed according to subject, inventor, source, number, and accession number. Author

N75-20150*+ National Aeronautics and Space Administration, Washington, D.C.
NASA PATENT ABSTRACTS BIBLIOGRAPHY: A CONTINUING BIBLIOGRAPHY. SECTION 2: INDEXES
Jan. 1975 473 p refs
(NASA-SP-7039(06)-Sect-2) Avail: NTIS HC $5.00 CSCL 05B

For abstract see, N75-20149.

N75-20151 Purdue Univ., Lafayette, Ind.
INFORMATION-PRESERVING CODING FOR MULTISPECTRAL SCANNER DATA Ph.D. Thesis
Jen-Reen Duan 1974 133 p
Avail: Univ. Microfilms Order No. 74-26705

Measurements of the electromagnetic energy through various wave length bands of the electromagnetic spectrum are collected by sensors onboard aircraft and satellites over the spatial area of interest. The possibilities for effectively reducing the number of bits needed to represent the imagery data without loss of information are studied and practical algorithms developed. A folding technique is introduced as a means to simplify the selection of the number of quantization levels for data with large dynamic range and, perhaps, with a unimodal but otherwise unknown probability mass function. This technique involves identifying the normal operating range spanned by the data samples. The infrequent occurrence of a data falling out of this range is signalled by a folding code word and the range covered by the code is instantaneously expanded to reach the infrequent data.
Dissert. Abstr.

N75-20152+ Bibliotheques Nationale, Paris (France). Bureau pour l'Automatisation des Bibliotheques.
ORGANIZATION AND SYSTEMATIC UTILIZATION OF A GENERAL CATALOG OF SCIENTIFIC AND TECHNICAL LIBRARIES AND DOCUMENTATION CENTERS Final Report [ETUDE TECHNIQUE EN VUE DE L'ORGANISATION ET DE L'EXPLOITATION SYSTEMATIQUE DU CATALOGUE COLLECTIF DES BIBLIOTHEQUES ET CENTRES DE DOCUMENTATION DANS LES DOMAINES SCIENTIFIQUE ET TECHNIQUES]
G. Dagand May 1973 269 p In FRENCH
(Contract DGRST-72-7-0821)
Avail: NTIS HC $8.50

A preliminary study of an information system for French public libraries is outlined. A general catalogue is developed as the first step in library automation. Existing computer networks are discussed, detailing data transmission, multiple access to files and security problem areas. Three systems, operational in the U.S.A., are analyzed. ESRO

N75-20153+ Institut Francais de Recherches Fruitieres Outre-Mer, Paris.
PREPARATION OF A THESAURUS OF TROPICAL AND SUBTROPICAL AGRICULTURE Final Report [PREPARATION D'UN THESAURUS DE L'AGRICULTURE TROPICALE ET SUB-TROPICALE COMPTE RENDU DE FIN DE CONTRAT]
P. Aries (Inst. Franc. de Rech. Fruitieres Outremer) 31 Jan. 1973 15 p In FRENCH
(Contract DGRST-72-7-0053)
Avail: NTIS HC $3.25

The process of preparing a thesaurus for homogenous indexing of literature in a common documentation system for tropical and subtropic agriculture, to be used by French overseas research institutes, is described. A first development step includes preparation of basic lists, creation of main categories of subjects and of specialist teams, and preparation of lexicons for each category. Further stages include hierarchical structuring of lexicons, magnetic storage of the data base, and publication. ESRO

N75-20154 Institut Textile de France, Boulogne- Billancourt. Service de Documentation.
RESEARCH FOR AN AUTOMATIC TRANSLATION SYSTEM FOR THE DIFFUSION OF SCIENTIFIC AND TECHNICAL TEXTILE DOCUMENTATION IN ENGLISH SPEAKING COUNTRIES Final Report [ETUDE EN VUE D'ACCROITRE LA DIFFUSION DE LA DOCUMENTATION TEXTILE SCIENTIFIQUE ET TECHNIQUE DANS LES PAYS DE LANGUE ANGLAISE PAR RECHERCHE D'UNE METHODE DE TRADUCTION AUTOMATIQUE]
J. M. Ducrot 1 May 1972 18 p In FRENCH
(Contract DGRST-72-7-0442)
Avail: Issuing Activity

A French-English textile dictionary of 13,000 terms was revised by a specialist team, and computer programs for abstracting and direct access information retrieval were written in IBM Assembler. A simplified univocal syntax was used for standard phrase preparation, from descriptors and linguistic operators. Standard phrases are constructed in coded graph form allowing direct translation to that of natural French and English language. ESRO

N75-20155*# National Aeronautics and Space Administration, Washington, D.C.
RESEARCH AND TECHNOLOGY OPERATING PLAN SUMMARY: FISCAL YEAR 1975 RESEARCH AND TECHNOLOGY PROGRAM
1975 197 p
(NASA-TM-X-70410) Avail: NTIS HC $7.00 CSCL 05B

Summaries are presented of Research and Technology Operating Plans currently in progress throughout NASA. Citations and abstracts of the operating plans are presented along with a subject index, technical monitor index, and responsible NASA organization index. Research programs presented include those carried out in the Office of Aeronautics and Space Technology, Office of Energy Programs, Office of Applications, Office of Space Sciences, Office of Tracking and Data Acquisition, and the Office of Manned Space Flight. M.J.S.

N75-20156# Cornell Univ., Ithaca, N.Y. Dept. of Computer Science.
A VECTOR SPACE MODEL FOR AUTOMATIC INDEXING
G. Salton, A. Wong, and C. S. Yang Jul. 1974 34 p refs
(Grant NSF GJ-43505)
(PB-238120/0; CU-CSD-74-218) Avail: NTIS HC $3.25 CSCL 05B

In a document retrieval or other pattern matching environment where stored entities (documents) are compared with each other, or with incoming patterns (search requests), it appears that the best indexing (property) space is one where each entity lies as far away from the others as possible; that is, retrieval performance correlates inversely with space density. This result is used to choose an optimum indexing vocabulary for a collection of documents. Typical evaluation results are shown demonstrating the usefulness of the model. GRA

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N75-20157# Little (Arthur D.), Inc., Cambridge, Mass.
DEPENDENCE OF THE UNITED STATES ON ESSENTIAL IMPORTED MATERIALS, YEAR 2000; VOLUME 1
Apr. 1974 160 p 2 Vol.
(Contract N00014-74-C-0253; NR Proj. 462-082)
(AD-A000842; ADL-C-76732-Vol-1) Avail: NTIS CSCL 05/3

An appraisal is made of U.S. dependence on imported essential materials which will move to the United States over sea lanes in the latter decades of this century. Topics discussed and summarized include minerals and metals, shipping considerations, energy and petrochemicals, manufactured goods, food, forest products, ocean resources, and the U.S. economy of the future.
Author

N75-20158# Little (Arthur D.), Inc., Cambridge, Mass.
DEPENDENCE OF THE UNITED STATES ON ESSENTIAL IMPORTED MATERIALS, YEAR 2000. VOLUME 2: APPENDICES
Apr. 1974 125 p 2 Vol.
(Contract N00014-74-C-0253; NR Proj. 462-082)
(AD-A000843; ADL-C-76732-Vol-2) Avail: NTIS CSCL 05/3

The forecasting of U.S. imports of essential materials is

discussed. Other topics discussed include strategic profiles of mineral imports for the year 2000, small and large quantities, U.S. domestic sources of energy, and U.S. national stockpile management. Author

N75-19304* National Aeronautics and Space Administration, Washington, D.C.
SPACE PROCESSING ECONOMICS
J. H. Bredt *In* ESRO Process. and Manufacturing in Space Jul. 1974 p 205-208 (For availability see N75-19285 11-12)

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N75-20159*# George Washington Univ., Washington, D.C. Program of Policy Studies in Science and Technology.
LAND USE POLITICS AND LAW IN THE 1970'S
Charles M. Lamb Jan. 1975 93 p refs
(Grant NGL-09-010-030)
(NASA-CR-142259; Monograph-28) Avail: NTIS HC $4.75 CSCL 05D

Political facets of the general land use challenge faced in the United States, and the legal authority for governmental action by state and federal officials under given conditions are discussed. Some current and future implications of these political and legal developments are presented. An overview of local versus state versus federal powers is presented along with practices for solving the nation's land use challenge. An analysis is provided of land use law and politics in five states playing active roles in land control. Land use politics and law at the federal level is addressed, with emphasis on three key legislative measures. Author

N75-20160*# Kanner (Leo) Associates, Redwood City, Calif.
THE USA: THE SCIENTIFIC AND TECHNICAL REVOLUTION AND TRENDS IN FOREIGN POLICY
G. A. Arbatov Washington NASA Feb. 1975 235 p refs Transl. into ENGLISH of the book "SShA: Nauchno-tekhnicheskaya revolyutsiya i tendentsii vneshn. politiki" Moscow, Mezhdunarodnaya Otnosheniya, 1974 p 1-255
(Contract NASw-2481)
(NASA-TT-F-16102) Avail: NTIS HC $7.50 CSCL 05D

The influence of the scientific and technical revolution on the foreign policy strategy of the United States is examined, and the interrelationship between the scientific and technical revolution and Washington policy in solving international problems of modern times was investigated. Other areas in the foreign political activities of the U.S. investigated include space, the oceans, and atomic energy. The basic areas of Soviet-American scientific and technical collaboration are briefly reviewed. Author

N75-20161# Committee on Aeronautical and Space Sciences (U. S. Senate).
NATIONAL AERONAUTICS AND SPACE ACT OF 1958, AS AMENDED, AND RELATED LEGISLATION
Washington GPO 1975 103 p refs Rept. prepared for Comm. on Aeronaut. and Space Sci., 94th Congr., 1st Sess., 11 Mar. 1975
(GPO-45-308) Avail: SOD HC $1.25

An act to provide for research into problems of flight within and outside the earth's atmosphere, the development, construction, testing, and operation for research purposes of aeronautical and space vehicles, and other activities as required for the exploration of space is presented along with related legislature. Legislation affecting the National Aeronautics and Space Act of 1958 included are the following: authorization of appropriations required; grants for support of scientific research; establishment of the National Air and Space Museum; implantation of the Unites Stated flag on the moon or planets; provisions of the Communications Satellite Act of 1962; authority to contract for Tracking and Data Relay Satellite Services; Solar Heating and Cooling Demonstration Act of 1974; Geothermal Energy Research, Development, and Demonstration Act of 1974; and Conservation Programs of Public Lands. J.M.S.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N75-20162*# Kanner (Leo) Associates, Redwood City, Calif.
WATER TRANSPORT ACROSS CATION-EXCHANGE MEMBRANES. 3: MODEL FOR THE INTERPRETATION OF THE INFLUENCE OF POLARIZATION LAYERS ON THE WATER TRANSPORT NUMBERS
C. Ripoll, M. Demarty, and E. Selegny Washington NASA Mar. 1975 30 p refs Transl. into ENGLISH from J. Chim. Phys. (Paris), v. 71, no. 6, 1974 p 828-835
(Contract NASw-2481)
(NASA-TT-F-16168) Avail: NTIS HC $3.75 CSCL 13K

A theoretical interpretation of electroosmotic measurements of a cation-exchange membrane under natural or imposed convection is discussed. The calculations are based on the steady-state flow properties described by Nernst-Planck equations. The membrane is assumed to be homogeneous, and the thickness of the polarization layers, described in Nernst's hypothesis, is supposed to be identical. It was possible to express the parameters which influence the electroosmotic flow, especially the influence of concentration polarization. It is shown that polarization is one of the factors that make it possible to explain the dependence of the water transport number on the current and that this dependence is closely connected with the types of convection that exist on the membrane/solution interfaces. Author

N75-20163# Miami Univ., Coral Gables, Fla.
DIVIDENDS FROM SPACE, VOLUME 1 AND 2 M.S. Thesis
Nancy-Lee Olsen Jun. 1972 507 p refs
Avail: NTIS HC $12.25

Benefits accrued from the space program are presented. It is indicated that a scientific and technological revolution put into motion by the joint effort of NASA, industry, scientific community, and academic researchers has affected man's social, economic, and industrial problems as well as providing breakthroughs in fabrics, metallurgy, electronics, food processing, communications, ceramics, medicine, and other fields. It is shown that an extensive program is needed for effective transfer of this technology to the American public. J.M.S.

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N75-20164 Northwestern Univ., Evanston, Ill.
AN INVESTIGATION OF 1400 ABOVE-THE-MAIN SEQUENCE CLOSE BINARIES Ph.D. Thesis
Lee Tobey Shapiro 1974 222 p
Avail: Univ. Microfilms Order No. 74-28743

Methods were devised for detecting above-the-main sequence close binaries that have at least one component above the main sequence. The principal method of detection was the presence of a deep primary eclipse. It is shown that any eclipsing binary with an eclipse at least one and a half magnitudes deep

must be an above-the-main sequence close binary. Such determinations are made without even knowing the temperature class of the primary star. When the temperature class of the primary star is known, above-the-main sequence close binaries with eclipses even shallower than one and a half magnitudes can be recognized using the tables in the text. Other methods of selection involved spectroscopic classification and a sufficiently long primary eclipse. Using these methods a catalogue of 1400 above-the-main sequence close binaries was compiled. Over 800 have no spectroscopic classification at all, while more than 300 do not have any period determinations. Dissert. Abstr.

N75-20165*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MSFC SKYLAB GROUND-BASED ASTRONOMY PROGRAM
B. J. Duncan Dec. 1974 324 p refs
(NASA-TM-X-64882) Avail: NTIS HC $9.25 CSCL 03A

The Skylab Ground-Based Astronomy Program (SGAP) was conducted to enhance the data base of solar physics obtained during the Apollo Telescope Mount (ATM) mission flown in conjunction with the Skylab orbital station. Leading solar physicists from various observatories obtained data from the ground at the same time that orbital data were being acquired by ATM. The acquisition of corollary solar data from the ground simultaneously with the ATM orbital observations helped to provide a broader basis for understanding solar physics by increasing spectral coverage and by the use of additional sophisticated instruments of various types. This report briefly describes the individual tasks and the associated instrumentation selected for this ground-based program and contains as appendices, the final reports from the Principal Investigators. Author

N75-20166# Observatorio Astronomico Nacional, Santiago (Chile).
THIRD SANTIAGO-PULKOVO FUNDAMENTAL STARS CATALOGUE (SPF 3). A CATALOGUE
R. R. Loyola and V. N. Shishkina Nov. 1974 25 p refs Repr. from Univ. de Chile Publicaciones, v. 2, no. 5, Dec. 1972 p 159-180
Avail: NTIS HC $3.25

A method and program are discussed for determining the right ascensions of bright and reference stars. Observations were made with the Zeiss broken transit instrument, and the results are presented along with preliminary correction in right ascension, corrections to the preliminary azimuth system, and comparisons with other catalogs. M.J.S.

N75-20167# Konkoly Observatory, Budapest (Hungary).
PHOTOELECTRIC OBSERVATIONS OF AN SERPENTIS
S. Kanyo and B. Szeidl 1974 18 p refs
(Rept-64) Avail: NTIS HC $3.25

Three-color photoelectric photometry of the RRab star AN Serpentis is presented. The period change of the star was investigated. No light curve variation or nonrepetitive behavior were noted during the time interval covered by the observations. Author

N75-20168# Konkoly Observatory, Budapest (Hungary).
THE RR LYRAE: VARIABLE TT LYNCIS
J. Tremko (Astronomical Inst. of the Slovak Acad. of Sci., Skalnate Pleso, Czech.) 1974 14 p refs
(Rept-66) Avail: NTIS HC $3.25

Three color photoelectric observations of the RR Lyrae variable TT Lyncis obtained at the Konkoly Observatory and Skalnate Pleso Observatory are discussed. The investigation shows a constant period of light changes and a stable light curve of the variable star. A color - color diagram was constructed. On the basis of the period-luminosity relation, the absolute magnitude of TT Lyn was determined, and a distance of r =660 pc is derived by applying the correction for the interstellar absorption. Author

N75-20169# Canada Inst. for Scientific and Technical Information, Ottawa (Ontario).
DETERMINATION OF THE CONSTANT OF ABERRATION AND SHORT-PERIOD TERMS OF NUTATION FROM OBSERVATIONS WITH THE PULKOVO POLAR TUBE DURING 1953-1964
N. M. Bakhrakh 1974 32 p refs Transl. into ENGLISH from Izv. Gl. Astron. Observ. Pulkove (USSR) no. 187, 1971 p 97-115
(NRC/CNR-TT-1786) Avail: NTIS HC $3.75

A description is given of the main stages of a reduction of the observations obtained with the Pulkovo polar tube. The observational data (photographs of the circumpolar region) were used for a determination of numerical values of the constant of aberration and coefficients of the short period nutation. For the reduction of observations the polar distances of stars were measured, the scale of the plates were determined, and the observed polar distances were compared with those deduced from the catalog data in a provisional system of astronomical constants. Corrections are derived from the solution by the method of least squares of the system of conditional equations. All computations for this reduction were made by the BESM-2 electronic computer. Author

N75-20170# Tokyo Astronomical Observatory (Japan).
SIMULTANEOUS OPTICAL AND RADIO OBSERVATIONS OF BL LAC AND 3C 120
Hiroto Tabara, Sen Kikuchi, Yoshitaka Mikami, Nobuyuki Kawano (The Radio Res. Labs., Kashima), Nobuhiro Kawajiri (The Radio Res. Labs., Kashima), Takeyuki Ojima (The Radio Res. Labs., Kashima), Makoto Inoue (Nagoya Univ.), Masahiro Konno (Kyoto Univ.), Kiichiro Tomino (Kyoto Univ.), and Tsuneaki Daishido (Tokyo Univ.) 20 Mar. 1974 5 p refs Repr. from Tokyo Astron. Bull., Ser. 2 (Japan), no. 228, 20 Mar. 1974 p 2633-2637
Avail: NTIS HC $3.25

The correlation between optical and radio variations was studied by making simultaneous observations in the photographic B and V colors with the flux density at 7.2 cm. The typical error of five percent was caused by gain fluctuations and artificial interferences. Author

N75-20171# Tokyo Astronomical Observatory (Japan).
A REFLECTOR TYPE BEAM SWITCHING FOR MILLIMETER WAVE TELESCOPE, AND ITS APPLICATION TO A SEARCH FOR INTERSTELLAR MOLECULE OF CH3NH2
K. Akabane, T. Miyaji, and Y. Chikada 2 Apr. 1974 9 p refs Repr. from Tokyo Astron. Bull., Ser. 2 (Japan) no. 229, 2 Apr. 1974 p 2639-2647
Avail: NTIS HC $3.25

A rotating reflector covering the primary feed of Cassegrain system was used for beam switching of the 6 meter millimeter wave radio telescope of the Tokyo Astronomical Observatory. Performance of the switching system and some observational results used to find an interstellar molecular line of CH3NH2 are presented. Author

N75-20172# Tokyo Astronomical Observatory (Japan).
PHOTOELECTRIC MONITORING OBSERVATIONS OF FLARE STARS. 9. AD LEO AND UV CET (1973)
Kihachiro Chimura, Yasuhiro Shimizu, and Kiichi Okida [1974] 5 p refs Repr. from Tokyo Astron. Bull., Ser. 2 (Japan), no. 230, 18 Apr. 1974 p 2649-2651
Avail: NTIS HC $3.25

Photoelectric monitoring observations of flare stars AD Leo and UV Cet were carried out at the Okayama Station during the periods of international cooperative observations in 1973. The observations were made with the simultaneous three-color photometer attached to 91 cm reflector. The characteristics of the observed flares are shown along with their light curves. Author

N75-20173# Tokyo Astronomical Observatory (Japan).
OBSERVATIONS OF MUTUAL PHENOMENA OF GALILEAN SATELLITES, 1
Tsukoh Nakamura [1974] 20 p refs Repr. from Tokyo Astron. Bull., Ser. 2 (Japan), no. 231, 9 May 1974 p 2655-2674
Avail: NTIS HC $3.25

Mutual phenomena of Galilean satellites in 1973 were observed, and six light curves for four phenomena could be obtained at Nara. A computer program to provide an ephemeris of the satellites based on Sampson's original theory was also constructed in order to compare the observations with the theory.

especially with respect to the central times of the phenomena.
Author

N75-20174# Tokyo Astronomical Observatory (Japan).
A BEAM SWITCHING OF PHASE-SHIFTER TYPE FOR MILLIMETER-WAVE TELESCOPE
Kenji Akabane, Yoshihiro Chikada, and Keisuke Miyazawa [1974] 11 p refs Repr. from Tokyo Astron. Bull., Ser. 2 (Japan), no. 232, 25 May 1974 p 2675-2685
Avail: NTIS HC $3.25

A rotating phase shifter is installed between the primary feed and the secondary reflector of the Cassegrain system of a 6 meter millimeterwave telescope as a device for beam switching. A half area across the beam flux from the feed is covered with a half wave dielectric plate alternately so that the zero point of the reference beam comes in the center of the signal beam. Performance of the beam switching and its application to some millimeter-wave observation are presented. Author

N75-20175# Tokyo Astronomical Observatory (Japan).
NARROW-BAND PHOTOMETRY AND SPECTROSCOPIC OBSERVATIONS OF BETA LYRAE
Masao Kiyokawa and Sen Kikuchi [1974] 18 p refs Repr. from Tokyo Astron. Bull., Ser. 2 (Japan), no. 233, 29 May 1974 p 2687-2704
Avail: NTIS HC $3.25

The narrow-band photoelectric photometry in H alpha and H beta was made with the 36-inch reflector at the Okayama Astrophysical Observatory, and the spectroscopic Observations in the H alpha-region with the 74-inch reflector at the same observatory. Most of the observations were made simultaneously. The photoelectric photometer used for the narrow-band photometry was furnished with a Toshiba-PM55 photomultiplier tube, which is sensitive up to the near-infrared region, and four interference filters whose particulars are shown along with their transmission curves. Author

N75-20176# Sydney Observatory (Australia).
ASTRONOMY IN AUSTRALIA
Harley Wood, comp. 1973 22 p
(Paper-67) Avail: NTIS HC $3.25

An account is presented of astronomy and astronomical research conducted at various observatories and institutions in Australia. A short history and research summary from each facility is included. M.J.S.

N75-20177# Sydney Observatory (Australia).
ASTRONOMICAL SITE PROSPECTS IN NEW SOUTH WALES
Harley Wood [1974] 19 p refs
(Paper-70) Avail: NTIS HC $3.25

Meteorological data and topographical information were collected to define the areas in which sites might be sought and to assist in selection of actual sites to be visited for on-the-spot examination for suitability. Sites were also analyzed according to the feasibility of erecting buildings on them and according to the services available. Site requirements, cloud data, wind measurements, and possible sites are presented. M.J.S.

N75-20178*# Arizona Univ., Tucson. Steward Observatory.
IMAGE DISSECTOR CONTROL AND DATA SYSTEM, PART 1 Final Technical Report
1 Oct. 1974 128 p ref
(Grant NGR-03-002-032)
(NASA-CR-142350; A-74-9) Avail: NTIS HC $5.75 CSCL 03A

A general description of the image dissector control and data system is presented along with detailed design information, operating instructions, and maintenance and trouble-shooting procedures for the four instrumentation packages. The four instrumentation packages include a 90 inch telescope, a simplified telescope module for use on the 90 inch or other telescopes, a photographic plate scanner module which permits the scanning of astronomical photographic plates in the laboratory, and the lunar experiment package module. M.J.S.

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N75-20179 Maryland Univ., College Park.
THE EARLY HISTORY OF THE LUNAR INCLINATION Ph.D. Thesis
David Parry Rubincam 1974 180 p
Avail: Univ. Microfilms Order No. 74-29106

The effect of tidal friction on the inclination of the lunar orbit to the earth's equator for earth-moon distances of less than 10 earth radii is examined. The results obtained bear on a conclusion which was raised as a fatal objection to the fission hypothesis of lunar origin: that the present nonzero inclination of the moon's orbit to the ecliptic implies a steep inclination of the moon's orbit to the earth's equatorial plane in the early history of the earth-moon system. This conclusion is shown to be valid only for particular rheological models of the earth. In the case of a viscous earth, the results indicate that the problem of wrenching the moon out of an equatorial orbit into an inclined orbit to account for the present tilt of the lunar orbit to the ecliptic must be faced in the accretion theory of the moon's origin and possibly the capture theory, as well as in the fission theory. A solution to the inclination problem is presented.
Dissert. Abstr.

N75-20180# Carnegie Institution of Washington, Pasadena, Calif.
ASTROPHYSICAL INVESTIGATIONS Annual Report, 1 Jul. 1973 - 30 Jun. 1974
Dec. 1974 71 p refs Repr. from Carnegie Inst. Year Book 1973, Jun. 1974 p 121-187
Avail: NTIS HC $4.25

Results of astrophysical investigations conducted at the Hale Observatories are presented. Areas of research discussed include physics of the sun, solar system studies, stellar spectroscopy and photometry, stellar chromospheres, infrared sources, millimeter-wave observations, interstellar matter and gaseous nebulae, X-ray sources, supernovae, galaxies, clusters of galaxies, radio sources, quasars and quasi-stellar objects, observational cosmology, and instrumentation. M.J.S.

N75-20181*# Scientific Translation Service, Santa Barbara, Calif.
MAGNETIC FIELD OF MARS BASED ON DATA FROM THE MARS-5 SATELLITE
Sh. Sh. Dolginov, Ye. G. Yeroshenko, L. N. Zhuzgov, and V. A. Sharova Washington NASA Mar. 1975 10 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (USSR), v. 218, 1 Oct. 1974 p 795-798
(Contract NASw-2483)
(NASA-TT-F-16232) Avail: NTIS HC $3.25 CSCL 03B

Magnetometers on the spacecraft Mars-2 and Mars-3 were used to measure the magnetic fields in the immediate vicinity of the planet Mars. The results of those measurements are given along with data from the Mars-5 satellite. Other topics discussed include shock fronts, solar wind, the magnetosphere, and eigen magnetic fields. Author

N75-20182*# Scientific Translation Service, Santa Barbara, Calif.
PLASMA IN THE ANTISOLAR REGION OF NEAR-MARTIAN SPACE ACCORDING TO THE MARS-5 SATELLITE MEASUREMENT RESULTS
K. I. Gringauz, V. V. Bezrukikh, M. I. Verigin, and A. P. Remizov Washington NASA Mar. 1975 10 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (USSR), v. 218, 1 Oct. 1974 p 791-794
(Contract NASw-2483)
(NASA-TT-F-16231) Avail: NTIS HC $3.25 CSCL 03B

The preliminary results of sounding measurements of plasma ion and electron components on Mars-5 and Mars-7 are presented. The measurements were made in March 1974 in the antisolar region near Mars. Author

N75-20183# Owens Valley Radio Observatory, Pasadena, Calif.
VLBI OBSERVATIONS OF OH/IR STARS
Mark J. Reid and Duane O. Muhleman 1974 13 p refs
(Contract N00014-67-A-0094-0019)

(AD-A002236; Rept-1974-14) Avail: NTIS CSCL 03/2

Very long baseline interferometric observations of 5 type II OH/IR objects indicate that the apparent size of the masering regions are about or greater than 0.1 seconds of arc. The present observations, combined with current theories, indicate that the 1612 MHz OH maser associated with Mira variables originates in the outer regions of the circumstellar dust. GRA

N75-20184# Owens Valley Radio Observatory, Pasadena, Calif.
A MODEL FOR THE 1612 MHz MASERS IN OH-IR STARS
Moshe Elitzur, Peter Goldreich, and Nick Scoville 1974 54 p refs
(Contract N00014-67-A-0094-0019)
(AD-A002237; Rept-1974-13) Avail: NTIS CSCL 03/2

Shklovsky (1966) first suggested that OH masers might be pumped by the absorption of infrared radiation. Subsequently, the physics of the pump process was investigated by Litvak (1969) and by Litvak and Dickenson (1972). The present paper attempts to bring into sharper focus the essential features responsible for the inversion of the 1612 MHz transition in OH-IR stars. GRA

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N75-20185*# Texas Univ., Fort Davis. McDonald Observatory.
ELECTROSTATIC DUST TRANSPORT AND ITS CONSEQUENCES FOR THE LUNAR RANGING EXPERIMENT
E. C. Silverberg Mar. 1975 23 p refs
(Grant NGR-44-012-165)
(Memo-75-003) Avail: NTIS HC $3.25 CSCL 03B

Attempts made to qualitatively model the available data concerning the electrostatic transport of dust on the lunar surface are noted. Charged dust grains, held in place by adhesive forces, are shot into space at velocities of hundreds of meters per second. Larger particles, because of their greater charge, are quickly decelerated in the nearby fields, while the smaller grains travel in ballistic trajectories for hundreds of kilometers. Flux estimates indicate that there is little danger to the optical corner reflectors for the next few decades. Author

N75-20186*# Texas A&M Univ., College Station. Dept. of Physics.
COMMENTS ON 'VENUS' SPECTROSCOPIC PHASE VARIATION: IMPLICATIONS OF THE MARINER 10 PHOTOGRAPHS
Andrew T. Young 2 Apr. 1975 11 p refs Submitted for publication
(Grant NGR-44-001-117)
(NASA-CR-142347; Rept-12) Avail: NTIS HC $3.25 CSCL 03B

From a misinterpretation of Mariner 10 pictures, Chamberlain (1974) constructed a model in which he used horizontal variations in the Venus atmosphere to explain the phase-variation of CO2 absorption at small phase angles. Published observations of spatial variations in CO2 absorption on Venus show that they are too small to explain the phase effect. The question of uniqueness that is, if more than one model can explain the phase-effect observations is discussed. Before this question can be answered, a realistic model that does account for the data must be constructed. No such calculations exist. Author

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N75-20187 California Inst. of Tech., Pasadena.
ABSOLUTE TRANSITION PROBABILITIES FOR Ni I AND THE SOLAR NICKEL ABUNDANCE Ph.D. Thesis
William Norman Lennard 1974 212 p
Avail: Univ. Microfilms Order No. 74-24446

Absolute transition probabilities were measured for 97 lines from 11 levels in Ni I using the lifetime and branching ratio technique. Relative transition probabilities were determined for 6 lines out of 2 levels whose lifetimes were measured elsewhere. Equivalent widths were measured from the Kitt Peak Preliminary Solar Atlas for 48 of the lines for which absolute transition probabilities were measured. An empirical solar curve of growth was constructed for Ni I to test the consistency of the transition probability and equivalent width measures. The solar data were used to calculate a value for the photospheric Ni abundance A sub Ni = 6.29 + or - 0.2 based on the results of the transition probability measurements. A new transition was observed in the Ni I spectrum. Dissert. Abstr.

N75-20188 Institut National d'Astronomie et de Geophysique, Meudon (France).
SOLAR ECLIPSE OBSERVATION ON 30 JUNE 1973 FROM CONCORDE 001: PROVISIONAL SUMMARY OF RESULTS Final Report [OBSERVATION DE L'ECLIPSE DE SOLEIL DU 30 JUIN 1973 MENEE A PARTIR DU CONCORDE 001 (BILAN PROVISOIRE DES RESULTATS)]
P. Charvin Mar. 1973 9 p In FRENCH
(Contract DGRST-73-7-1171)
Avail: Issuing Activity

Solar eclipse observations carried out on 30 June 1973 onboard Concorde 001 are reviewed. Results for five experiments are outlined, with regard to terrestrial dust belt, solar corona K and F observations, coronal waves, infrared chromosphere radiation, and stratospheric oxygen radiation. ESRO

N75-20189*# Stanford Univ., Calif. Inst. for Plasma Research.
SEARCH FOR CORRELATION BETWEEN GEOMAGNETIC DISTURBANCES AND MORTALITY
B. J. Lipa, C. W. Barnes, P. A. Sturrock, M. Feinleib (NIH, Bethesda, Md.), and E. Rogot (NIH, Bethesda, Md.) Mar. 1975 13 p refs
(Grants NGL-05-020-272; NSF GA-42401)
(NASA-CR-142292; SU-IPR-623) Avail: NTIS HC $3.25 CSCL 03B

Statistical evaluation of death rates in the U.S.A. from heart diseases or stroke did not show any correlation with measured geomagnetic pulsations and thus do not support a claimed relationship between geomagnetic activity and mortality rates to low frequency fluctuations of the earth's magnetic field. G.G.

N75-20190*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
ANALYSIS OF OSO DATA TO DETERMINE THE STRUCTURE AND ENERGY BALANCE OF THE SOLAR CHROMOSPHERE
Eugene H. Avrett and Wolfgang Kalkofen Feb. 1975 26 p ref
(Grant NGR-09-015-210)
(NASA-CR-142262; SAO-503-060) Avail: NTIS HC $3.75 CSCL 03B

A detailed reexamination of the temperature-density structure of the photosphere and low chromosphere shows that the middle and upper chromosphere, which directly emits most of the OSO spectrum, is sensitive to conditions in this underlying region of the atmosphere. A model of this region is based on a unified compilation of all recently published broadband flux and central intensity observations of the solar spectrum from 500 microns in the far infrared to 1220 A in the far ultraviolet. This extensive compilation includes the OSO 4 and 6 observations in the wavelength range 1400 to 1220 A. A model is presented of the quiet solar atmosphere in the height range between the temperature minimum and the upper part of the chromosphere-corona transition region. This model is based on statistical equilibrium calculations of H, He 1, He 2, Si 1, C 1, and other ions. Author

N75-20191# National Aerospace Lab., Tokyo (Japan).
THE EFFECT OF SOLAR RADIATION PRESSURE ON THE MOTION OF AN ARTIFICIAL SATELLITE
Sumio Takeuchi Aug. 1974 15 p refs In JAPANESE; ENGLISH summary
(NAL-TR-387) Avail: NTIS HC $3.25

The effect of solar radiation pressure on the motion of an artificial satellite was investigated using Lagrange's planetary equations. The disturbing function due to the solar radiation pressure was expanded in an infinite series in terms of osculating elliptic elements. Neglecting the coupling effects between the oblateness of the earth and the solar radiation pressure, perturbations of the first order were obtained. The shadow equation is expressed by means of the quadratic equation in terms of rectangular coordinates, and the limits of integration were obtained by solving the shadow equation analytically. The theory was applied to the orbits of the geostationary satellite and the balloon-type satellite, and variations of orbital elements were calculated. Author

N75-20192# Los Alamos Scientific Lab., N.Mex.
NEAR INFRARED PHOTOGRAPHY OF THE OUTER CORONA DURING THE 30 JUNE 1973 SOLAR ECLIPSE
L. J. Radziemski, Jr. Aug. 1974 10 p refs
(Contract W-7405-eng-36)
(LA-5590-MS) Avail: NTIS HC $3.25

Near infrared photographs of the solar corona were made at sea level from a ship, Canberra, positioned about 300 miles west of Nouakchett, Mauritania. Polarimetry was obtained by taking exposures through HR plane polarizing filters oriented at three successive 60 deg intervals. Kodak 2424 Aerographic infrared film was used. The pass band of the filter-film combination was about 90 nm centered around 840 nm. The inner corona was occulted by a disk placed 1.5 m in front of an f/2.9, 230-mm-focal-length, Dallmeyer lens. One complete set of frames was obtained which shows changes in streamer structure with changing filter orientation. On the frame with the polaroid's axis of transmission almost parallel to the north solar axis, four outer coronal streamers to the west can be followed and two broad diffuse streamers to the east where they merge into a single blur. A broad, diffuse illumination is also visible to both east and west. Author (NSA)

N75-20193*# Stanford Univ., Calif.
THE RELATIONSHIP BETWEEN SOLAR FLARES AND SOLAR SECTOR BOUNDARIES Inst. for Plasma Research.
P. H. Dittmer 23 Oct. 1974 13 p refs
(Grant NGR-05-020-559; Contract N00014-67-A-0112; Grant NSF GA-31138)
(NASA-CR-142422; AD-A002287; SU-IPR-597) Avail: NTIS HC $3.25 CSCL 03/2

A superposed epoch analysis of 1964-1970 solar flares shows a marked increase in flare occurrence within a day of (--) solar sector boundaries as well as a local minimum in flare occurrence near (--) sector boundaries. This preference for (--) boundaries is more noticeable for Northern Hemisphere flares, where these polarities match the Hale polarity law, but is not reversed in the south. Plage regions do not show such a preference. GRA

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N75-20194 Calgary Univ. (Alberta). Dept. of Physics.
CLASSICAL CHARGED PARTICLE RADIATION IN ORTHOGONAL MAGNETIC AND ELECTRIC FIELDS Ph.D. Thesis
David W. Hobill Jun. 1974 71 p refs
Copyright. Avail: Issuing Activity

A review of the problems and solutions that arise from the Lorentz-Dirac equation is presented. The trajectories for both the nonrelativistic and relativistic case were found for a particle influenced by external, orthogonal electric and magnetic fields constant in space and time. Energy losses for these particles were calculated. The limits to the applicability of the classical theory presented are discussed. Author

N75-20195 Stanford Univ., Calif.
LOW-ENERGY RADIO EMISSIONS FROM THE EARTH AND SUN Ph.D. Thesis
Nicholas Dunckel 1974 178 p
Avail: Univ. Microfilms Order No. 74-27010

New features of solar type 3 bursts, plasma-wave emissions and high-pass or earth noise (also called terrestrial kilometric radiation) are revealed by a sensitive sweeping receiver operating in the 10 to 100 kHz range on the OGO-1 and OGO-3 satellites. A new feature of the study was the comparison of the dynamic spectra of type 3 bursts with the azimuthal distribution of density in the interplanetary medium. Dynamic spectra observed at times when the associated flare was in a position to illuminate a dense interplanetary region with energetic particles suggest that generation took place in this dense region. Shocks propagating in the interplanetary medium can cause enhancements in the type 3 burst spectra. The relative times of arrival at 1 AU of energetic particles and low-frequency type 3 bursts indicate that the exciting particles are electrons not protons. The effects on the emitted wave of refraction and reduced velocity due to the coronal density are shown to be minimal. Dissert. Abstr.

N75-20196 Stanford Univ., Calif.
INFRARED MASER EMISSION FROM INTERSTELLAR HYDROGEN MOLECULES Ph.D. Thesis
Robert Frank Pelzmann, Jr. 1974 136 p
Avail: Univ. Microfilms Order No. 74-27079

The energy structure and transition rates of OH radical were carefully studied in rotational and vibrational energy to provide the basis for studies of the population distributions under various exciting mechanisms. The absorption of ultraviolet or near infrared radiation which Litvak and others have proposed to explain the microwave emission was studied, as well as the absorption of low temperature blackbody radiation and collisions with molecular hydrogen. Each of these provides population inversion in some infrared lines, while dipole collisions with charged particles does not. For high pumping rates the emission is unsaturated and the intensity is an exponential function of the size of the cloud. For lower pumping rates or larger sizes the region of unsaturated emission shrinks until the entire region is saturated, the intensity then becoming a linear function of the size of the emitting cloud. Dissert. Abstr.

N75-20197*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PROJECT SOLWIND: SPACE RADIATION EXPOSURE
E. G. Stassinopoulos Feb. 1975 104 p refs Submitted for publication
(NASA-TM-X-70860; X-601-75-70) Avail: NTIS HC $5.25 CSCL 03B

A special orbital radiation study was conducted for the SOLWIND project to evaluate mission-encountered energetic particle fluxes. Magnetic field calculations were performed with a current field model, extrapolated to the tentative spacecraft launch epoch with linear time terms. Orbital flux integrations for circular flight paths were performed with the latest proton and electron environment models, using new improved computational methods. Temporal variations in the ambient electron environment are considered and partially accounted for. Estimates of average energetic solar proton fluences are given for a one year mission duration at selected integral energies ranging from E greater than 10 to E greater than 100 MeV; the predicted annual fluence is found to relate to the period of maximum solar activity during the next solar cycle. The results are presented in graphical and tabular form; they are analyzed, explained, and discussed. Author

N75-20198# Los Alamos Scientific Lab., N.Mex.
PROCEEDINGS OF CONFERENCE ON TRANSIENT COSMIC GAMMA- AND X-RAY SOURCES
I. B. Strong, comp. Feb. 1974 317 p refs Conf. held at Los Alamos, N. Mex., 20-21 Sep. 1973
(Contract W-7405-eng-36)
(LA-5505-C) Avail: NTIS HC $9.25

Summaries and abstracts of reports are presented. Topics discussed at the conference include cosmic gamma rays, gamma ray bursts, X-ray bursts, energy spectra, OGO-5 satellites, radio emissions, neutron stars, angular resolution, and X-ray sources. M.J.S.

N75-20199# Owens Valley Radio Observatory, Pasadena, Calif.
RADIATIVE TRAPPING AND HYPERFINE STRUCTURE: HCN (11)
John Kwan and N. Z. Scoville 1974 16 p refs
(Contract N00014-67-A-0094-0019; Grants NSF GP-40768; NSF GP-30400)
(AD-A002231; Rept-1974-11) Avail: NTIS CSCL 07/4

The anomalous weakness of the F = 1 to 1 hyperfine component in the J = 1 to 0 emission of interstellar HCN can be caused by radiative trapping in the J = 2 to 1 lines. The anomaly is readily produced if the J = 1 levels are populated largely by collisional excitation from J = 0 to J = 2 followed by radiative decay to J = 1 with the J = 2 to 1 lines optically thick. Regions where the anomaly is found probably have H2 density less than 10000/cc and optical depths in the J = 1 to 0 lines greater than 100. GRA

99 GENERAL

N75-20200# Royal Radar Establishment, Malvern (England).
RRE NEWSLETTER AND RESEARCH REVIEW, NO. 13, 1974
1974 140 p refs
(Rept-13) Avail: NTIS HC $5.75

Articles in this research review are concerned with the areas of electronics, electro-optics, materials handling, assessment, and computer applications. Topics discussed include solid state microwave components and their applications, charge couple devices for signal processing, phased array antennas, optical information theory, heterodyne detection, and computers. M.J.S.

N75-20201# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON EASTERN EUROPE: SCIENTIFIC AFFAIRS, NO. 455
21 Feb. 1975 19 p Transl. into ENGLISH from East European reports
(JPRS-64146) Avail: NTIS HC $3.25

Articles are presented concerning the development and progress in various theoretical and applied scientific disciplines and technical fields. For individual titles, see N75-20202 through N75-20203.

N75-20202 Joint Publications Research Service, Arlington, Va.
IMPORTANCE OF THEORETICAL PHYSICS FOR NATURAL SCIENCES **c70**
Klaus Fuchs *In its* Transl. on Eastern Europe: Sci. Affairs, No. 455 (JPRS-64146) 21 Feb. 1975 p 4-10 Transl. into ENGLISH from Spektrum (East Ger.), Nov. 1974 p 12-15 (For availability see N75-20201 11-99)

Theoretical physics is discussed along with their correlation with mathematics. The importance of chemistry and physics theories is presented. Cosmology and biological kinetics are also discussed. M.C.F.

N75-20203 Joint Publications Research Service, Arlington, Va.
HUNGARIAN DESIGN INSTRUMENT PACKAGE FOR INTERKOSMOS-12 **c35**
In its Transl. on Eastern Europe: Sci. Affairs, No. 455 (JPRS-64146) 21 Feb. 1975 p 11-12 Transl. into ENGLISH from Magyar Ifjusag (Budapest), no. 3, 17 Jan. 1975 p 17-18 (For availability see N75-20201 11-99)

The design of the Interkosmos-12 satellite is discussed. The development of an electronic device for the collection of micrometeorites is described. M.C.F.

N75-20204# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON EASTERN EUROPE: SCIENTIFIC AFFAIRS, NO. 454
12 Feb. 1975 40 p Transl. into ENGLISH from East European reports
(JPRS-64093) Avail: NTIS HC $3.75

Research on laser deflectors for holographic memories is discussed. Critical path activity network construction is also described, using the PERT method. For individual titles, see N75-20205 through N75-20206.

N75-20205 Joint Publications Research Service, Arlington, Va.
LASER DEFLECTORS FOR HOLOGRAPHIC MEMORIES BEING DEVELOPED **c36**
In its Transl. on Eastern Europe: Sci. Affairs, No. 454 (JPRS-64093) 12 Feb. 1975 p 12-13 Transl. into ENGLISH from Muszaki Elet (Budapest), 3 Jan. 1975 p 2 (For availability see N75-20204 11-99)

It was found that the direction of the laser beam bend changed precisely to the extent of changing the grid constant by ultrasonic frequency. This produced a laser deflector having a resolution capability of 3,000 points. The intensity of the bent laser beam could be modulated as a fixed frequency but with changing ultrasonic amplitude. An acoustic optical Q-switch for YAG lasers is also considered, along with a process of developing a two dimensional, coherent light modulator. J.A.M.

N75-20206 Joint Publications Research Service, Arlington, Va.
CPM AND PERT METHODS APPLIED IN RESEARCH AND DEVELOPMENT **c81**
Jerzy Wyszomirski *In its* Transl. on Eastern Europe: Sci. Affairs, No. 454 (JPRS-64093) 12 Feb. 1975 p 27-35 Transl. into ENGLISH from Inwestycje i Budownictwo (Warsaw), no. 11, Nov. 1974 p 36-40 (For availability see N75-20204 11-99)

Critical path activity network construction is described. The advantages and disadvantages of using the PERT and CPM for network research are discussed. The PERT program is used to automatically compute the average times for network implementation. Network diagrams are included. J.A.M.

N75-20207# European Space Research Organization, Paris (France).
LA RECHERCHE AEROSPATIALE. BI-MONTHLY BULLETIN NO. 1974-2
Dec. 1974 121 p refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1974-2, Mar.-Apr. 1974 p 69-118
(ESRO-TT-113) Avail: NTIS HC $5.25; ONERA, Paris 20 F

Topics are discussed in the fields of aerodynamics, turbines, materials and structures. The vorticity produced by the interaction of a sound field on a variable entropy fluid layer is considered. A simplified setup for the study of two supersonic, plane, parallel flows at different Mach numbers, was used to understand complex stratified flows in supersonic compressors with shocks. The hot fatigue crack growth rate of AU2GN aluminum alloy was investigated. For individual titles, see N75-20208 through N75-20215.

N75-20208 European Space Research Organization, Paris (France).
PRODUCTION OF VORTICITY BY INTERACTION OF A SOUND FIELD AND A FLUID LAYER WITH VARIABLE ENTROPY **c02**
Henri Burnage *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1974-2 (ESRO-TT-113) Dec. 1974 p 1-14 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1974-2, Mar.-Apr. 1974 p 69-73 (For availability see N75-20207 11-99)

Analysis rests on the theory of interactions of modes in a supersonic field. It is carried out in a simplified case in order to avoid the difficulties which would be introduced by insufficiently known boundary conditions, but the fundamental physical mechanism of interaction is conserved. It is shown that the resulting vorticity increases downstream and tends asymptotically towards a value proportional to the sound field intensity and to that of the entropy gradient. Author (ESRO)

N75-20209 European Space Research Organization, Paris (France).

THE COEXISTENCE OF TWO SUPERSONIC PLANE FLOWS IN THE PRESENCE OF A LONGITUDINAL PRESSURE GRADIENT **c02**

Jacques Paulon, Xavier Garonne et al *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1974-2 (ESRO-TT-113) Dec. 1974 p 15-34 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1974-2, Mar.-Apr. 1974 p 75-82 (For availability see N75-20207 11-99)

A study of two supersonic, plane, parallel flows at different Mach numbers, but at the same pressure, is used to contribute to the understanding of the complex stratified flows encountered in supersonic compressors with shocks. In particular, it sheds some light on the shape of de-energization shock waves and allows the verification of the correlation formulas used for calculating flow separations at the walls. Author (ESRO)

N75-20210 European Space Research Organization, Paris (France).

MEASUREMENT OF FATIGUE CRACK PROPAGATION AT HIGH TEMPERATURES IN AU2GN ALUMINIUM ALLOY **c26**

Georges Vidal, Pierre Yves LeRoy et al *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1974-2 Dec. 1974 p 35-59 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1974-2, Mar.-Apr. 1974 p 83-93 (For availability see N75-20207 11-99)

Tests were carried out to check the validity of the Paris law in hot fatigue in the case of AU2GN aluminum alloy. The fatigue tests in undulated tension were performed at 35 Hz on large 1.4 mm thick specimens. The specimen was heated by radiating tubes. Four main series of tests were performed: three on unplated (at 20,100 and 150 C) and one on aluminium-plated AU2GN (at 100 C). At 100 C, the experimental points for the unplated and plated states of the alloy are almost superposed, which shows that, at that temperature, aluminium plating has no noticeable influence. For unplated alloy, experimental points at 20, 100, and 150 C are practically the same, which indicates that, in this range, temperature influence on crack growth rate is negligible. Author (ESRO)

N75-20211 European Space Research Organization, Paris (France).

APPLICATION OF THE ELECTRET EFFECT TO MINIATURE TRANSDUCERS **c35**

Jean-Claude Alliot *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1974-2 (ESRO-TT-113) Dec. 1974 p 60-85 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1974-2, Mar.-Apr. 1974 p 95-105 (For availability see N75-20207 11-99)

By applying the electret effect (quasi-permanent electrostatic polarization), it is possible to design miniaturized microphonic transducers of capacitive type, functioning without any external polarization source. After a description of such transducers, methods used to improve their performance are presented. Author (ESRO)

N75-20212 European Space Research Organization, Paris (France).

SOME NOTES ON THE THERMODYNAMICS OF THRUST REVERSAL IN FLIGHT **c77**

Pierre Garriere *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1974-2 (ESRO-TT-113) Dec. 1974 p 86-88 Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1974-2, Mar.-Apr. 1974 p 107 (For availability see N75-20207 11-99)

It is shown that, in order to obtain a maximum braking effect in flight, the thrust reversal should take place in a manner leading to the greatest possible irreversibility through interaction of the jet with the external free flow. Thrust reversers should be tested, not on a test bench, but in a wind tunnel only. Author (ESRO)

N75-20213 European Space Research Organization, Paris (France).

DETERMINATION BY MEANS OF HYDRAULIC ANALOGY OF THE TRANSONIC FLOW IN A BLADE CASCADE **c02**

Emilien Robert, Lucien Reding et al *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1974-2 (ESRO-TT-113) Dec. 1974 p 89-101 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1974-2, Mar.-Apr. 1974 p 108-112 (For availability see N75-20207 11-99)

A technique is described for studying the flow through the interblade channels of a transonic cascade and for determining the position of the flow isobars. The use of injected powder particles and motion picture photography reveals the flow velocity and direction along the isobars. Author (ESRO)

N75-20214 European Space Research Organization, Paris (France).

THE BRANCH MODE METHOD APPLIED FROM EXPERIMENTAL VIBRATION MODES **c39**

Rolland Dat *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1974-2 (ESRO-TT-113) Dec. 1974 p 102-110 Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1974-2, Mar.-Apr. 1974 p 112-114 (For availability see N75-20207 11-99)

A method of partial modes for determining the natural vibration mode of composite structures made up to several substructures, is described. The formulation is particularly advantageous for cases in which vibration tests are used in determining the modal characteristics of each substructure. Author (ESRO)

N75-20215 European Space Research Organization, Paris (France).

FATIGUE CRACK PROPAGATION OF AN AU2GN ALUMINIUM ALLOY AS A FUNCTION OF THE RUPTURE MODE **c26**

Georges Vidal, Pierre Yves LeRoy, Dominique Miannay et al *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1974-2 (ESRO-TT-113) Dec. 1974 p 111-117 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1974-2, Mar.-Apr. 1974 p 115-117 (For availability see N75-20207 11-99)

Results of measurements by Vidal and Le Roy (1974) of fatigue crack propagation rates in an AU2GN aluminum alloy are reexamined as a function of two fracture modes characterized by fatigue fracture surfaces: (1) at a nearly 90-deg angle to the stress; and (2) at a nearly 45-deg angle to the stress. The reexamination results show similar crack propagation rates for both modes under a law of additivity of the stress intensity factors concerned. Author (ESRO)

N75-20216# Naval Research Lab., Washington, D.C.

REPORT OF NRL PROGRESS

May 1974 86 p refs

(PB-236643/3) Avail: NTIS HC $4.75 HC also available from NTIS on subscription $22.50/year domestic, $28.50/year foreign CSCL 05B

Progress reports are presented on varied areas of research, including: acoustics, fire suppression, magnetooptics, electronics, chemistry, solid state physics, amorphous materials, metallurgy, radar, and ocean sciences. GRA

N75-20217# Naval Research Lab., Washington, D.C.

REPORT OF NRL PROGRESS

Jul. 1974 60 p refs

(PB-237430/4) Avail: NTIS HC $4.25 Also available from NTIS on subscription $40.00/year domestic, $28.25/year foreign CSCL 05B

For abstract see, N75-20216.

N75-20218# California Univ., La Jolla. Inst. for Pure and Applied Physical Sciences.

RESEARCH IN RADIATION PHYSICS AND AERODYNAMICS Semiannual Technical Status Report, 1 Oct. 1973 - 31 Mar. 1974

S. C. Lin 31 Mar. 1974 27 p refs

(Contract DAHC04-72-C-0037; ARPA Order 570)

(AD-A001817; ARO-10757.61-P) Avail: NTIS CSCL 20/4

Contents: Highlights of recent accomplishments; Report of progress in brief--Laser physics, Optics and atmospheric propagation, High-temperature entrainment and metal oxide emissivity, Plume physics and radiation, Stratified flow and ocean physics, Ionospheric physics and plasma interactions. GRA

N75-20219# Cost Analysis Improvement Group, Washington, D.C.

OPERATING AND SUPPORT COST DEVELOPMENT GUIDE FOR AIRCRAFT SYSTEMS

May 1974 65 p refs

(AD-A001747) Avail: NTIS CSCL 15/5

This guide provides a DSARC/CAIG framework for review of new weapon system life cycle operating and support (O and S) cost estimates and describes methodologies and techniques that the Military Departments and the CAIG can use to develop and record these estimates. GRA

N75-20220# Systems Control, Inc., Palo Alto, Calif.

INSTRUCTION MANUAL FOR THE INTERACTIVE TACTICAL ENGAGEMENT MODEL. VERSION 2, ITEM 2: EXECUTIVE SUMMARY Final Report

David M. Salmon and Robert J. Ducott Sep. 1974 22 p refs

(Contract DAAH01-74-C-0583; SCI Proj. 5116)

(AD-A002079) Avail: NTIS CSCL 15/3

This executive summary is one of three companion volumes describing a battalion level model of the SAM-D and IMPROVED HAWK air defense systems. References 1 and 2 provide respectively and Analyst/Programmer Manual and a Planner/Users Manual. GRA

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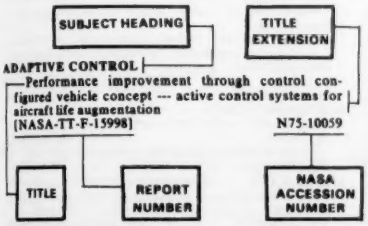
TYPICAL SUBJECT INDEX LISTING



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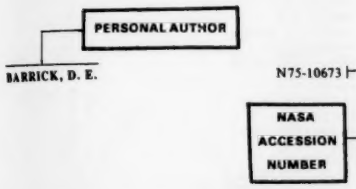

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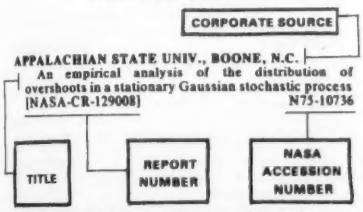

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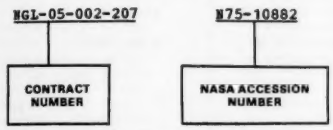

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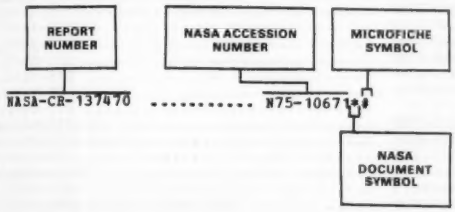

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